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CLINCHING POWER PROPOSITIONS.

In extending central-station power service it is an excellent plan to be able to add convincing arguments to an original proposition involving the introduction of motor service in factories long accustomed to the use of the steam-engine drive. These supplementary points usually do not affect the soundness of the first estimate of comparative operating cost under the old and the proposed methods, but they are sometimes of the utmost value in helping to turn the scale of the manufacturer's judgment in favor of the central-station man.

In a representative instance where the cost of electric cooking by central-station energy was being compared with the expense of manufacturing the food product by coal cooking, it happened that the latter appeared to be more economical under the local conditions, and the consulting engineer so informed the owner of the factory. The latter, however, was a broad-minded man; none other, in fact, than the late Mr. Henry D. Perky, inventor of various shredded-wheat products; and upon the presentation to his consideration of the advantages of electric cooking on the score of convenience and above all, of cleanliness, he decided at once to cook a new product then coming forward by electric stoves. The decision was a wise one, as events proved, and it illustrated the importance of taking all factors into account in cases where net operating cost may be against the central station.

In a recent power report, which is still under consideration, the local central station estimated a saving of about $300 a month to the factory by the use of its service. The negotiations indicated, however, that a supplementary report upon various features of the proposed change from mechanical drive to motors would be wise, and in this presentation a number of matters were included which in many cases could be turned to account elsewhere. It was shown that duplicate cables would be available to the factory from the central station, removing the owner's fears of the cost of a shutdown in case of a failure on one three-phase line; and it was pointed out that by suitable switchboard apparatus of low cost, a loss of power on one cable with the other alive would require the factory to be without service only a fraction of a minute, if, indeed, the slow-down of the motors were continued long enough to bring them to a stand-still. Again, it was shown that the local power company was keenly interested in mak-

ing the installation of its service at the least cost consistent with reliability. It was found that by tapping a passing 2300-volt, three-phase line on a street bordering on a distant part of the property, the cost of running a long cable to a 200-horsepower motor driving an air compressor would be saved. It was also figured that by throwing two sets of busbars in the mill substation in multiple, in ordinary operation, losses could be saved which would be reflected in the meter records and consequently in the monthly bills. Finally, the supplementary report included a complete list of the salvage value of all shafting and its auxiliary equipment which would have to be removed in installing an efficient drive, with a totalization of the number of vertical belts, idlers, hangers, quarter-turn pulleys, and shafting length which would be eliminated by the adoption of electricity. Another helpful feature was a list of new shafting parts which would have to be purchased.

Data of this character, if presented in a clean-cut manner, convince the hard-headed man to whom the central station is trying to sell its service that the latter does not carry on its work by guess, and unquestionably go a long way toward clinching the power contract in difficult cases.

ENGINEERING AS A POST-GRADUATE STUDY.

The announcement that beginning next fall the engineering courses at Columbia University will be put on a post-graduate basis marks an important tendency in higher education which is full of significance to the close observer of industrial conditions in America. Such a step means that preparation for real professional work is becoming more thorough than in the past; that the higher responsibilities of the engineer must, on the whole, be met by men of a broader training than is afforded by the ordinary four years' technical curriculum; and that the ultimate result of such a policy will go far to place the engineer upon his true plane in the estimation of society. The man of exceptional ability will, of course, continue to make a name for himself and carry unique responsibilities as at present; but in general, the effect of such a change will be to supply the world with picked men capable, so far as education can insure it, of doing work of the most advanced grade and standing on precisely the same basis of professional regard as the lawyer, the physician and the clergyman.

Such a stiffening of the requirements for an engineering degree in a school which for half a century has existed as an undergraduate department should lead to the engineer's taking a larger place in public affairs than in the past, through his wider knowledge of affairs and broader culture. It should fit him more intelligently to advise executives in many fields, besides better qualifying him for administrative duties on his own account. Obviously, however, the cost of the proposed six years' course leading to a degree in one of the great engineering branches is likely to deter a great many men from its completion; but fortunately the engineering industries are large enough to need men of very diversified training, and the young man with a genuine interest in technical matters and a keen ambition to work his way forward should not be discouraged by any such action as is planned at Columbia.

In the electrical field, for example, there are needed under normal conditions of development men of an immense range of abilities and tastes. The industry needs the substation operator studying in a correspondence or Young Men's Christian Association electrical course no less than it needs the designer of motors; it needs the salesman of lamps and the canvasser of power prospects even as it needs the university instructor and the consulting specialist in hydroelectric development. The range of the engineering occupations is certainly far beyond that of the medical profession, which has one central responsibility, and which must be safeguarded against the entrance of men with partial preparation. Such a limitation does not apply to the engineering industry, and it is a cause for congratulation that its catholicity permits at one and the same time the modest training of humble workers for better positions and the advanced education of the graduate student to fit him to grapple with the larger scientific and business problems of this wonderful age.

THE ENGINEER AND PUBLIC AFFAIRS.

The discussion last month by Stevens Institute alumni, which is abstracted in this issue, serves to focus attention upon the relation which the engineer should bear not only to regulation by public utility commissions but to governmental administration in general. The need was there pointed out for administrative ability as well as engineering knowledge by those who are to have charge of such matters.

The remarks above point out how Columbia University is making a step towards meeting this need by turning out engineering graduates who will have a general knowledge of economics, political science, history and other subjects which are essential to a grasp of large problems connected with government administration. Stevens, Harvard and other engineering schools are also attempting to give their students a wider preparation for after life than is included in a curriculum made up solely of such engineering subjects as can be crowded into four years of study.

It is not alone, however, in preparation for duties of a broad administrative nature that the engineer is lacking, but even more in the disposition to familiarize himself with public affairs, to take a direct hand in politics or even to take sufficient interest in local affairs to make himself generally known in his own community and become a leader of public opinion in regard to engineering matters of a public nature. The criti-

cisms leveled at public utility commissioners at the Stevens alumni meeting are equally applicable to other public officials in all walks of public life, whether elective or appointive. So long as engineers in general fail to take an active interest in public affairs they must not be surprised if the men put into public office display not only a lack of engineering knowledge but a lack of appreciation of its importance. The fault of present conditions lies mainly with the engineers themselves. As a class they have not kept in touch with public affairs and consequently public officials have generally not kept in touch with them. Nevertheless in matters essentially engineering in their nature engineers are of course always called in. It is in cases where the engineering relations are not so evident, as in the public utility commissions, that engineers do not receive the recognition which their profession deserves. However, New York is not the only state in which the need of an engineer upon the public utility commission has been recognized. Missouri and Illinois present examples of recent recognition of the desirability of having an engineer as a member of the state utility commission. As Dr. Humphreys so well emphasized, however, such an appointment upon utility commissions should not be restricted to a single member, but should represent rather a majority of the commission; or at least outnumber any other particular class represented in such appointments.

In no political body is the need for engineers more urgent than in the varied service of our large cities. More than half of the activities of a city are essentially of an engineering character. The problems connected with street paving, street lighting, street cleaning and refuse disposal, traffic regulation, local transportation, improved housing, water supply, sewerage, city planning and other similar municipal projects are problems which should be handled by engineers rather than by professional politicians.

Unfortunately, engineers are usually no more conversant with such important subjects as the law, economics and business administration than are the representatives of these classes with engineering. Latterly, there has been evident, to be sure, a merging of engineering and financial interests, as represented in the large holding and operating companies in control of chains of public utility properties, with the result that executives of large administrative capacity have been and are being developed along lines represented by such a combination. Such men are, however, as yet but few in number and their services are in demand under conditions which do not invite them to enter the public service.

To change the conditions which are today so much deplored by engineers, it is necessary that engineers enter intensively into public affairs, at least to the extent of taking an active interest and letting this interest be felt in their local communities. The man who does not take the trouble to vote, and never attends public meetings to participate in discussions of local community questions, is not likely to be recognized as an important element in the solution of government problems, whether engineering or otherwise, and his profession will not be looked upon as such a necessary element in their solution. When we have more engineers known for their ability and interest in public matters in their own communities; when we find them representing the public in city councils and upon village boards of trustees; we will find them also receiving more recognition from state and federal administrations, and their voices will be exercising a greater influence in their proper sphere, such as the regulation of public utilities.

ANOTHER ADVANTAGE OF ELECTRIC COOKING.

Aside from the question of cost, it has been generally recognized that electric cooking has the advantages of cleanliness, lack of odor, and the saving in weight of such meats as are roasted or baked. Another advantage has been brought out in the operation of a large electric grill connected with a restaurant in the city of London, England. This grill has been operated for over three months, and is generally in use about 12 hours a day. Only broiling operations are carried on upon it and it is provided with a drip pan, so that all of the fat which drips from the meat is collected in a vessel below. It turns out that this fat, which is wasted in ordinary forms of cooking, can be sold at a price which more than pays for all of the electric energy used in the cooking process. The cost of electricity, which is usually raised as the insurmountable obstacle to its use for this purpose, turns out in this case a negative quantity, and there is an actual saving over and above the price of fuel which was consumed in the previous installation. The amount of fat which was collected in this way amounted to about six pounds per day.

This installation is said to have given complete satisfaction from the cooking standpoint and in addition to the economic advantage pointed out above it is found that 40 to 50 per cent more can be accomplished upon a grill than was the case when coke or gas was used for fuel. This means a greatly increased catering capacity with the same equipment.

This point should be kept in mind when the question of electric cooking is being considered and should remove the principal obstacle to its introduction in large restaurants. The combination of good cooking, which is also more hygienic, with the quick service made possible by the electrical method, should result in increased popularity for any restaurant using this method. Considering the load-factor which should prevail in such use, central stations should find it possible to quote a rate which would enable restaurants to install equipment of this type. In the case above considered, electrical energy was purchased at two cents per kilowatt-hour. Considering the saving from fat, this could be doubled without imposing as great a burden upon the proprietor as was represented by the former cost of gas.

Mid-Winter Meeting and Banquet of the American Electric Railway Association.

The mid-winter meeting and banquet of the American Electric Railway Association and the Electric Railway Manufacturers' Association were held at the Waldorf-Astoria Hotel, New York City, on January 29 and 30. Nearly 800 of the leading electric railway men of the country were present at the banquet which was held on the evening of January 29. In charge of the dinner was C. Loomis Allen, chairman, and the speakers of the evening were Charles N. Black, president of the American Electric Railway Association; Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company and the Hon. Henry W. Anderson, vice-president of the Virginia Railway & Power Company. Others at the speakers' table were Cornell S. Hawley, Thomas N. McCarter, James H. McGraw, Arthur W. Brady, D. M. Brady, H. H. Vreeland, C. C. Castle, C. S. Sergeant, W. L. Cornwell, General George H. Harries, W. H. Heulings, Jr., C. D. Goodrich, and Halford Erickson, of the Railroad Commission of Wisconsin.

Chicago Jovian League.

"Co-operation" was the subject of an interesting address delivered by Martin J. Wolf before the Jovian League of Chicago on February 2. The fact that the company or individual, when purchasing, wants unrestricted competition, but, when selling, wants restricted competition, is an elementary condition, but co-operation will improve this situation and make for constructive rather than destructive competition.

L. C. Leonard, Jovian statesman from Tennessee, spoke briefly regarding Jovianism in the South.

Prizes for members securing candidates for the last rejuvenation were awarded by F. W. Harvey, Jr., alternate statesman, at the close of the meeting.

Activities of the Western Society of Engineers.

At a general meeting of the Western Society of Engineers held in its rooms in the Monadnock Block, Chicago, on the evening of February 2, E. J. Mehren, editor of the *Engineering Record*, made an illustrated address on "The Making of a Technical Journal." He touched on nearly all the departments of such a publication, particularly the editorial, and urged a broadening out of the publicity work through co-operation with the editors of newspapers.

Directly after Mr. Mehren's talk the meeting resolved itself into the first of a series of regular monthly social gatherings enlivened by music, stories, poetry and refreshments. The Western Society of Engineers is composed of civil, electrical and mechanical engineers, who as a rule, have attended chiefly the meetings of the particular sections they were interested in. It is the aim of President E. H. Lee and the present administration, by making the general meeting on the first Monday of each month include largely entertainment and social features, to make the members of the three sections better acquainted with each other and with their several points of view. It is also hoped to make the Society's rooms more than ever the center of co-operative engineering activity in Chicago and contiguous territory.

Pennsylvania Telephone Meetings.

The convention of the Western Pennsylvania Telephone Association was held in Pittsburgh, Pa., on January 23 and 24. J. Walter Barnes, president of the Association, presided. At the opening session speeches were made by H. E. Webb, of Pittsburgh; and C. Phillips Hall, of the Doubleday-Hill Electric Company, of Pittsburgh. Delegates to the recent national convention of independents read reports. A number of girl operators invited to the convention, led in the discussion of "Handling the Service." Other speakers during the two days' session were: H. L. Lamb, California, Pa., "The Value of Publicity;" J. C. Core, Jr., of Uniontown, "The Toll Business;" T. J. Shuflin, of Butler, "Building Good Toll Lines;" W. S. Paca, Oil City, "Proper Maintenance;" W. H. Wilson, Erie, "Rural Lines;" and E. D. Schade, Johnstown, "The Pennsylvania Public Service Commission."

The fifth annual convention of the Western Pennsylvania Independent Telephone Association opened in the Hotel Antler, Pittsburgh, on January 22, with nearly 100 representatives present. President J. Walter Barnes, of Fairmont, W. Va., presided. H. E. Bradley, of Philadelphia, gave a short talk on "The New Female Labor Law;" J. C. Core, Jr., of Uniontown, talked on "The Toll Business" and T. J. Shufflin advised as to the manner in which toll lines should be built.

Galveston Jovian League.

At a meeting of the Galveston Jovian League on January 19, at Harmony Hall, there was a large attendance and arrangements were made to prepare for a big Jovian day during the convention of the Southwestern Gas and Electric Association, which is to be held at Galveston in May. A big rejuvenation will be held at that time and the Galveston degree team will make especial preparations for the event. Statesman W. R. Phipps was named chairman of a committee to handle the matter.

Following the business session there was a banquet and smoker. W. D. Masterson, city electrical engineer, gave a talk on wireless telegraphy, accompanied with demonstrations, a receiving and a sending station being placed in operation in the room.

A number of visitors were present, including A. J. Binz, B. S. Craig, Henry Albrecht, Jr., and M. T. Mason, all of Houston, Tex.

Electric Shows Planned.

Cleveland is to have an electrical exposition, with exhibits embracing every branch in the trade, to be held under the auspices of the Electrical League in May. The exact dates of the exposition have not been decided. Representatives of nearly 50 concerns agreed to take space at the show.

M. T. Turner, of the Cleveland Electric Illuminating Company; N. H. Boynton, of the National Electric Lamp Works; and T. P. Cagwin, of the Cleveland Telephone Company, were appointed members of a committee to investigate the project.

The Electric Show Association of Utah will hold its annual show at Salt Lake City during the first week of April. A large building has been secured for the occasion. The officers for 1914 have been elected as follows: B. W. Mendenhall, president; C. B. Hawley, vice-president; W. W. Torrence, secretary; and J. C. Gleeson, treasurer.

Organization of International Electrical Congress.

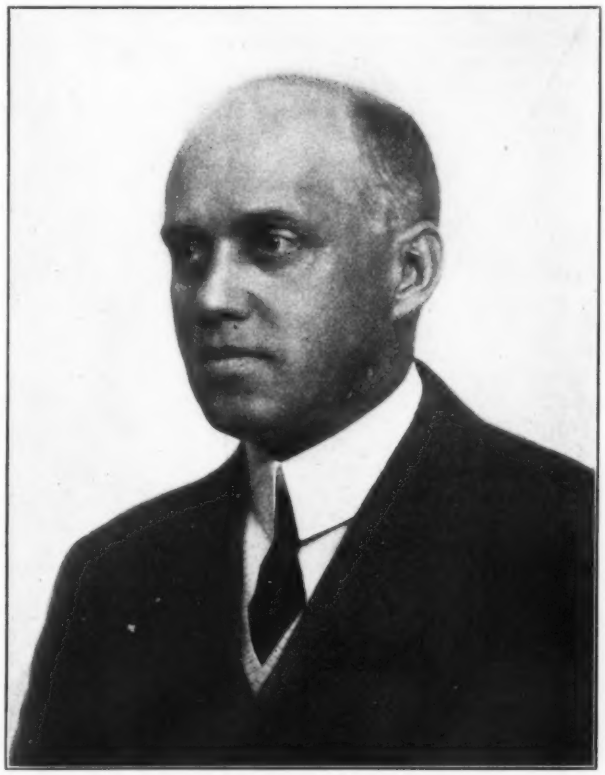
A dinner will be held at the Engineers' Club, New York City, on the evening of Wednesday, February 25, to discuss plans for the organization of the International Electrical Congress to be held at San Francisco in September, 1915. Invitations will be issued to members of the General Congress Committee of 150, to the officers of the American Institute of Electrical Engineers and its sections, and to members of its committees. The Executive Committee will make a report. The secretary of the Committee on Organization is Preston S. Millar, Eightieth Street and East End Avenue, New York City.

Chicago Electric Club.

Charles W. Peters, chief deputy sheriff of Cook County, was the principal speaker at the meeting of the Electric Club of Chicago on January 29. Mr. Peters presented statistics on crimes and criminals for the past year, and made several pertinent suggestions relative to the needs of the state in properly handling the situation.

William S. Boyd.

The popularity of modern electric service is in no small measure due to the well-known fact that electricity is now one of the safest forms of energy. When circuits and apparatus are properly installed, and fittings and materials of suitable design and correct construction are employed, the hazard attending the use of electricity for any proper purpose whatsoever is a quantity that is neglibly small. Where the conditions mentioned are not fulfilled, however, there is frequently danger of fire and liability of loss of life. That they are so generally fulfilled now is very largely the result of the efforts of a small group of men who, in the earlier days of the electrical industry, undertook to teach the public and the manufacturer of electrical appliances the importance of safe wiring, and who have continued in work of this kind. One of these men is William S. Boyd, of Chicago.



William S. Boyd,
Secretary of the Western Association of Electrical Inspectors.

Mr. Boyd was born in Aurora, Ill., moving to Hyde Park—which is now a part of Chicago—in 1876. After graduating from the Hyde Park High School in 1889, he entered the employ of the Thomson-Houston Electric Company, taking the "Expert Course" in the Chicago repair shops of the company to fit himself for the work of installing electric light and power plants.

During the next two years his work included the repairing, testing and installing of electrical wiring and apparatus in and about Chicago, later going with the electrical department of Armour & Company, at the Chicago Stock Yards. Leaving this position in 1891, Mr. Boyd associated himself with the Home Electric Company, of Seattle, and here, during a period of about two years, he had a broad experience in engineering and construction practice.

Mr. Boyd's next work was with what was then known as the Chicago Underwriters' Association, under the direction of W. H. Merrill, now the manager of the Underwriters' Laboratories, Inc. Mr. Boyd is proud of the honor of being the first man employed by Mr. Merrill in making laboratory tests on electrical materials. Here he divided his time equally between laboratory testing and the inspection of wiring and the rating of electrical power plants. From 1901 to 1903 he was in charge of the insurance department of the Western Electric Company, and in 1903 he joined the forces of "The (Western Insurance) Union," to extend and improve the municipal supervision of electrical wiring, and to advise Fire Insurance Companies in regard to electrical installation hazards and the proper safeguards.

In 1905 Mr. Boyd organized the Western Association of Electrical Inspectors, of which he is the very popular and very efficient secretary-treasurer. This association has grown to be one of the largest of the electrical societies, and, withal, one of the most useful. Its membership is drawn mainly from electrical inspectors throughout the central western section of the United States. Mr. Boyd has recently been elected to the office of secretary-treasurer of the Chicago Chapter of the National Fire Protection Association.

Mr. Boyd is a member of the Electrical Committee of the National Fire Protection Association which has in charge the preparation of the National Electrical Code and in the central West he is regarded as an authority upon its proper interpretation, being daily requested to settle disputes regarding the application of Code rules.

In addition to the activities already enumerated, Mr. Boyd has frequently been employed as an expert witness in law suits where the question of electrical fire hazard was involved, and as an expert in patent cases. He has sometimes been employed, too, to advise municipalities with reference to the electrical fire hazard and its proper regulation.

While, as the foregoing notes show, William S. Boyd is a man of fine training and splendid experience, his personality has unquestionably contributed in an unusual degree to his success in his chosen vocation. He is a quiet, unassuming, even-tempered sort of fellow, with a prevailing disposition to be accommodating whenever he can serve those among whom he lives and works. He is essentially a diplomat, but never shrinks from "calling a spade a spade" when occasion requires. There are few people who know him who are not his friends. He deserves that it should be so.

Banquet of Lynn Section.

The banquet of the Lynn Section, American Institute of Electrical Engineers, held at the American House, Boston, Saturday evening, January 24, was attended by 240 men, and marked another successful effort of this live organization.

The principal speaker was Thomas D. Lockwood, manager of the Patent Department of the American Telephone and Telegraph Company, whose address on general topics was greatly enjoyed.

President C. O. Maillox was a welcome visitor and complimented the Lynn Section upon its progress; also expressed the hope that the section would be fittingly represented at the International Electrical Congress to be held at San Francisco in September, 1915.

Walter C. Fish, manager of the Lynn General Electric factories; D. B. Rushmore, of Schenectady, and H. E. Clifford, of Harvard University, were each in turn introduced by Toastmaster W. A. Hall and spoke.

The decorations were in charge of C. A. B. Halvorson and S. C. Rogers, and the entertainment committee consisted of George Alton, J. Allan Dalzell and S. C. Rogers.

The membership of the Lynn Section is now larger than that of any other section, being 640, of whom nearly 100 belong to the national body.

Western Alumni Meet.

A very enthusiastic meeting of the Western Alumni Association of the Worcester (Mass.) Polytechnic Institute, in the form of a dinner to Dr. Ira N. Hollis, who has this year taken the presidency of the Massachusetts school, was held Wednesday evening, January 28, at the University Club, Chicago. Dr. Hollis is well known to the engineering profession and is remembered to all Harvard men as the Harvard Director of Athletics and the father of the Harvard stadium.

Dr. Hollis was the principal speaker at the dinner and brought good news of the eastern institute. About $500,000 has recently been added to the endowment, part of which is available in the form of a free scholarship to men from Illinois and other parts of the country. The W. P. I. is in no way a local institution, but draws its students from all over the world.

Elwood Haynes, the father of the automobile, and a graduate of the class of 1881, was present and was listened to with great interest. The announcement that the Alumni athletic field, for which the Alumni recently raised $150,000, was nearly completed and ready for football, baseball and tennis next year; also that the large new gymnasium would be started in the spring, was greeted with cheers by the old grads. About 30 of the local alumni were present at the dinner, which was presided over by Albert P. Allen, class of 1889, the president of the local association.

During his western trip Dr. Hollis will visit the University of Illinois, the University of Wisconsin and other institutions of learning with special reference to seeing their engineering departments.

Pittsburgh Section Meeting.

At a meeting of the Duquesne Light Company Section of the National Electric Light Association at the Colonial Hotel, Pittsburgh, Pa., on January 23, nearly 400 members attended. F. B. Patterson spoke on "The Inside Meter Department of the Laboratory;" H. S. Calderwood on "The Skilled and Schooled Workers," and W. A. Donkin on "Increase of the Sales Department."

Receivers Appointed for Central Union Telephone Company.

Receivers for the Central Union Telephone Company have been agreed upon by counsel in the suit against the company brought by minority stockholders. They are David R. Forgan, of the National City Bank, Chicago; Frank S. Fowle, consulting engineer of New York, and Edgar S. Bloom, vice-president of the Bell system in St. Louis.

Telephone Displacing the Telegraph.

At the meeting, in Washington, D. C., on November 13, 1913, of the Eastern Division of the Association of Railway Telegraph Superintendents, Theodore N. Vail, president of the Western Union Telegraph Company, and of the American Telephone & Telegraph Company, greeted the members present. A short discussion took place between Mr. Vail and some of the members. Among the remarks made by Mr. Vail, he said: "The first thing you know there will be no more railroad telegraphers; they will be railroad telephoners. It looks to me as though we were coming to that. I remember in the old days I used to be a railroad telegraph man myself, a pretty poor one at that. They would call and call and call, half an hour or so, and the operator called did not pay any attention to the call. There is something very curious about the telephone. It is the only thing that a man will drop everything to answer. A man comes to call on you; you tell him to wait outside, and, if you are busy, you take your time about seeing him, but the moment you hear the telephone bell ring it calls attention, and you answer it. It is a habit —that is all—people are accustomed to it."

New Wireless Stations.

The United States Navy Department will erect a wireless station at Point Isabel on the Texas Gulf Coast. This station will have three towers, each 300 feet high. An appropriation has already been made for the station and construction work is expected to begin within six months.

In a short time efforts will be made to establish communication between the new wireless station in Honolulu and the Marconi station at Clifden, Ireland. The distance is about 7,800 miles.

It has been announced that the Marconi Company will build the largest wireless station in the world at Marion, Mass.

Direct wireless communication between Germany and the United States has been established and on January 27 Kaiser Wilhelm sent a message by this means to President Wilson, which was received at the station at Tuckerton, N. J. The sending station is located at Eilvese, near Hanover, and is operated by the Goldschmidt company.

Boston Automobile Show Dates Announced.

The Boston Automobile Show of 1914 will be held in Mechanics Building March 7-21, the pleasure-car exhibit being held the first week and the truck exhibit the week following. Many electrics will be exhibited, as in former years.

Massachusetts Water Powers.

The commission on the investigation of water powers and water supply in Massachusetts, consisting of the chairman of the Gas and Electric Light Commission, the chairman of the Harbor and Land Commission and the Attorney-General, has issued a report to the Legislature in which it outlines some of the needs for a thorough investigation of the subject which it has not been able to make, owing to the small amount of money appropriated for the purpose, and asks the Legislature to decide on the question whether or not further work shall be done.

The report points out that the regulation of water powers in Massachusetts dates from the old mill act of more than a century ago, and that while dams of companies, both manufacturing and hydroelectric, are subject to the supervision of the county commissioners of the county in which the property is located, this authority is practically dormant. The larger bodies of water, known as "great ponds," are the property of the State, but there are few data available concerning them.

The subject of state investigation was brought about mainly through the project of a company to control water privileges in Miller's River and sell the water impounded to manufacturers located on the stream. It was noteworthy at the hearings that most of the manufacturing interests desired state control and even state ownership.

If the commission's suggestion for further investigation is adopted a tabulation of stream flow will be made for all important streams.

Air-Brake Tests.

Important improvements in the braking of heavy passenger cars will be described in a paper to be read before The American Society of Mechanical Engineers, at the Engineering Societies Building, New York City, on February 10, at 8:15 p. m., by S. W. Dudley, of Pittsburgh. These tests were conducted jointly by the Pennsylvania Railroad and the Westinghouse Air Brake Company. The results are considered the most important recent contribution to the subject of air brakes.

Commonwealth Edison Concert.

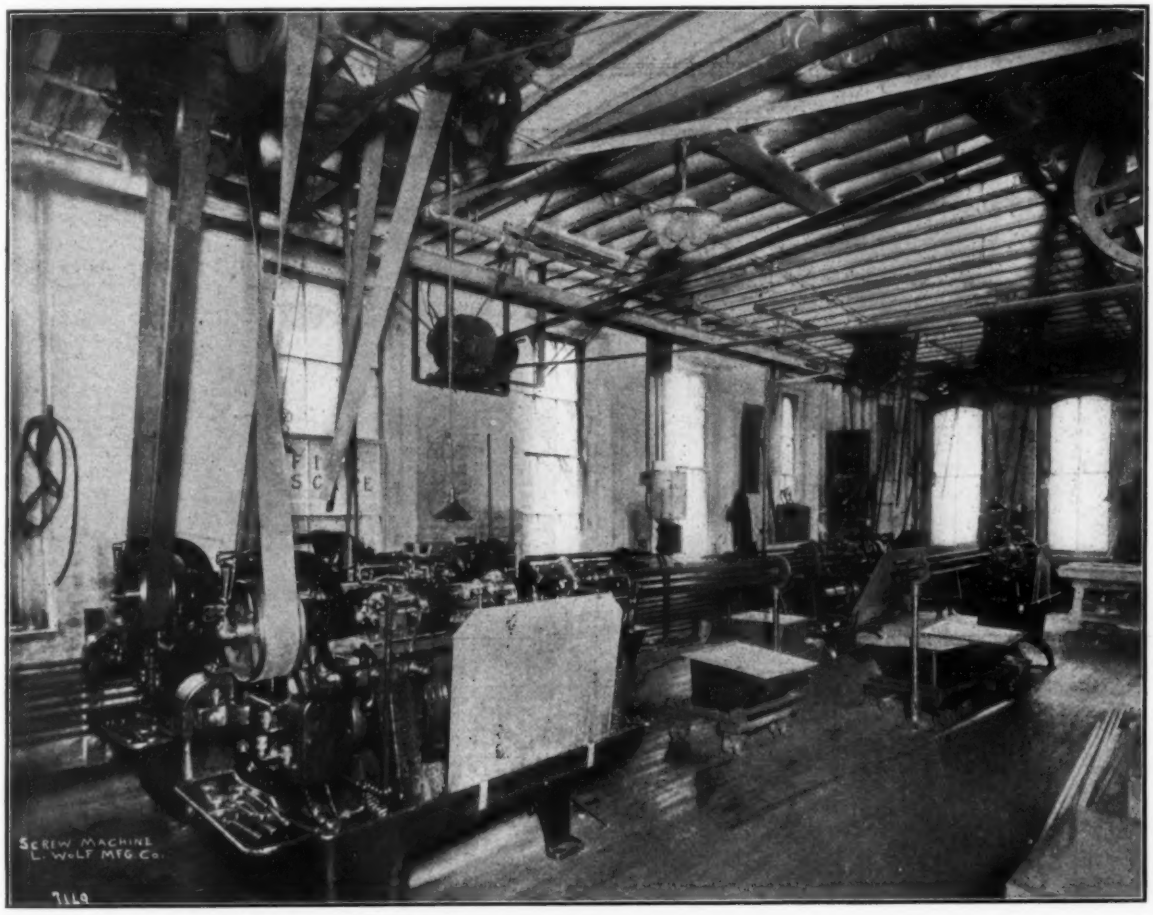
The Commonwealth Edison Orchestra, composed of 90 employees of the Commonwealth Edison Company, will give its second annual benefit concert in Orchestra Hall in that city on the evening of Thursday, February 12. The leader of the orchestra is Morgan L. Eastman. Miss Luella C. Ohrman, soprano soloist, will also have a place upon the program. Tickets for the concert are 50 cents each.

Electricity in Nut and Bolt Manufacturing.

In discussing the application of electric motor drive to factories engaged in the manufacture of nuts and bolts, comment is made on the numerous advantages and economies that have been demonstrated so forcibly in other metal-working establishments. Results of an exhaustive test conducted by A. E. Rickards in a bolt factory are presented, together with data on several typical plants.

The application of electric motor drive to plants engaged in the manufacture of nuts and bolts does not present problems that differ materially from the problems encountered in equipping general machine shops. There are, however, certain special conditions that apply specifically to the former that should be thoroughly understood by the central-station engineer before undertaking the equipping of such plants for electric drive.

As is true in all machine shops, motor drive has come to be recognized as the most efficient, flexible and economical form of power obtainable. As has been pointed out in these columns individual motors for the greater proportion of machine tools, and small group drive, have done much to better the general conditions in many factories, increasing the output and at the same time reducing the maintenance cost, eliminating not only the dangers attendant on the many rapidly moving belts and pulleys, but the enormous friction losses in the many bearings and slipping belts.



Group of Automatic Screw Machines Driven by Motors.

The removal of line and countershafting and belting means also better ventilation, better light and consequently better results in efficiency of both machines and operators. Economy of floor space is another very important factor to be considered, as with most machines it is possible to mount the motor in such a manner, either on or near the machine, as to take up practically no additional space, and allowing an arrangement of machines to conserve floor space that would be an impossibility with belt drive where the line shafting determines the position of the machine irrespective of light, accessibility or floor space.

It is said that the friction losses in ordinary belt-driven shop equipment average about 75 watts per horsepower for each hanger, and while this may seem to be excessive it is not at all improbable, taking into consideration the fact that hangers must be placed at frequent intervals on a line shaft and in many buildings become much displaced in alinement owing to the settling of floors from varying load strains placed on them and the side strain on the hangers from the countershafts, all of which naturally increase the friction losses.

With belt drive the speed of a machine must necessarily remain practically constant except in the case of

lathes or other machines where gearing and cone pulleys are utilized to effect changes, while with motor drive a wide range of speed, suited to varying conditions, is quickly and easily obtained; this feature alone adds to the sum total of the efficiency of the machine and widens its scope of work, saves time in transferring and setting up work, and results in a general saving of time, power and cost.

Speed range in connection with many machine tools is all-important, as the machine is often subjected to rough and ill usage at the hands of the operative, which causes abnormal strains upon the controlling apparatus; this must be so constructed as to be able to withstand the severe conditions which are imposed on it through inexperienced or careless manipulation and yet be reliable of operation, easily accessible and of simple construction.

The necessity of reliable automatic starting and speed-controlling apparatus to meet the requirements of the present-day equipment has brought out some highly efficient types of starting and regulating controllers, automatic and manually operated reversing controllers, float switches, pneumatic-electric and mechanical-electrical devices suited to practically any conditions under which a motor can be used for power, and while the cost of automatic starting apparatus prevents its installation in some cases, usually it will be found that it would have been, in the end, really cheaper and likewise much more satisfactory.

In selecting a motor for driving machine tools it is of great importance that the conditions affecting the machine it will drive are thoroughly understood and allowance must be made for abnormal conditions which may at times be imposed upon it. In the case of a machine which operates at very nearly the same load under all conditions a shunt motor may be used, but if the load varies at different periods, is light at one part of the operation and heavier at others a compound-wound motor is required.

The results of an investigation made recently in a Pennsylvania nut and bolt factory will demonstrate how the advantages as well as the economy of central-station service can be capitalized by the power salesman. The factory in question, previous to the adoption of central-station service, was using a gas engine, driving the machinery in the plant by means of shafts and belts. The usual tests were made in the engine room to determine the quantity of power generated, friction losses, etc., and the cost per kilowatt-hour.

Then, to determine the speed fluctuation throughout the factory and how it affected the output, a graphic tachometer was connected to the main line shafts. It was found that the average fluctuations of speed throughout the entire period was six per cent. The output of the driven machines, of course, varied in a like proportion.

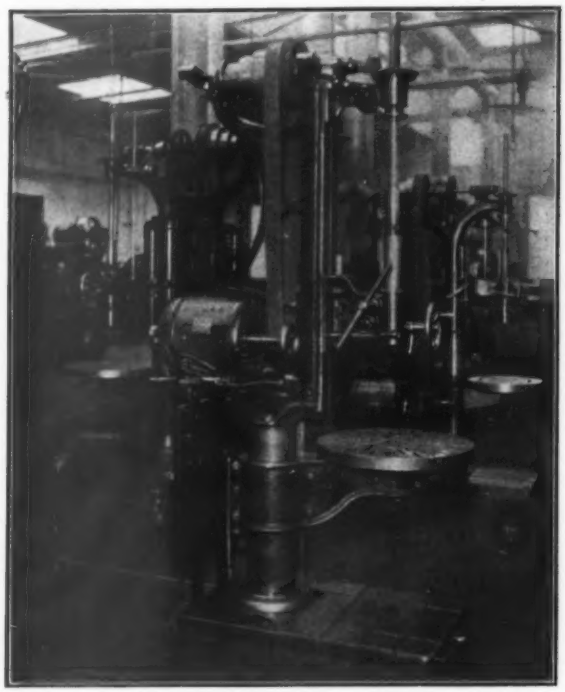
A study was made of the losses due to the upkeep and slippage of the belts. It was found that with correct motor applications, 48 belts could be eliminated and by doing so, this alone would increase the output 4.17 per cent. This percentage is calculated from data compiled by Frederick Winslow Taylor, who found from exhaustive tests, covering a period of nine years, that every belt gave an average of 26 interruptions to service during its life. On this basis each belt gave five interruptions to manufacture each year.

With the 48 belts, dispensed with in the plant in question, this would equal 240 interruptions per year. Assuming that two interruptions are equivalent to a complete rupture in the cycle of manufacture, and that the average time required to repair each belt is one hour, this would equal 120 hours loss to manufacture per year.

The total operating time was 2,880 hours per year; this divided into the loss of 120 hours equals 4.17 per cent.

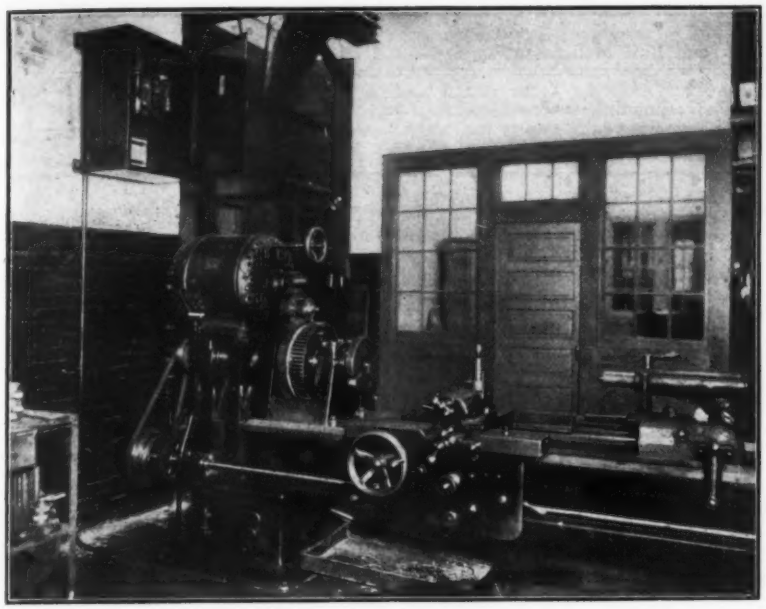
Studies of the operating and cutting speeds of the individual machines were made. Graphic meters were connected to the machines whenever possible and blue prints of the charts were incorporated in the report made by the central station.

Conditions found in the bolt-threading department may be cited as typical of the characteristics of line-shaft drive. In this department 30 machines are employed and not one was found to be operating at its correct speed. The following table shows the per cent of increased speed necessary to operate the



Group of Machines Driven by Individual Motors.

Motor-Driven Machines in Bolt Factory.



Motor Geared Directly to Lathe.

threading machines at their correct cutting speed:

TABLE I.

No. of Machine	Size of Bolt	Per cent of Speed Increase
1	¼	81
2	¼	73
3	⅜	24
4	⅜	33
5	½	49
6	½	19
7	½	65
8	½	30
9	½	34
10	⅝	27
11	⅝	39
12	¾	04
13	¾	26
14	¾	79
15	¾	10
16	¾	91
17	¾	58
18	¾	21
19	⅞	46
20	⅞	71
21	⅞	37
22	⅞	24
23	⅞	32
24	⅞	56
25	1	52
26	1	32
27	1	41
28	1	18
29	1⅛	37
30	1½	06

It will be seen from this table that on some of the machines it was necessary to increase the speed 90 per cent in order to operate them at their correct cutting speeds; this means that their production was increased about 65 per cent. It is also worthy of note that with line-shaft drive only 8 of the 30 machines in this department were operating within 25 per cent of their proper cutting speeds. It is also significant that no two machines, even those working on the same size bolts, operated at the same speed. Of the seven machines threading three-quarter-inch bolts, for instance, the cutting speeds during the period of test were 25.5, 23.5, 21.5, 21.75, 16.5, 14.5 and 13.5 feet per minute, respectively. The correct cutting speed for this size bolt is 26 feet per minute.

On the nut-tapping machines it was found that by increasing the cutting speed on the machines tapping 1.25-inch nuts or larger, that an increase in their output was obtained, while on the machines tapping smaller sizes than 1.25-inch, increasing their cutting speed did not increase the output.

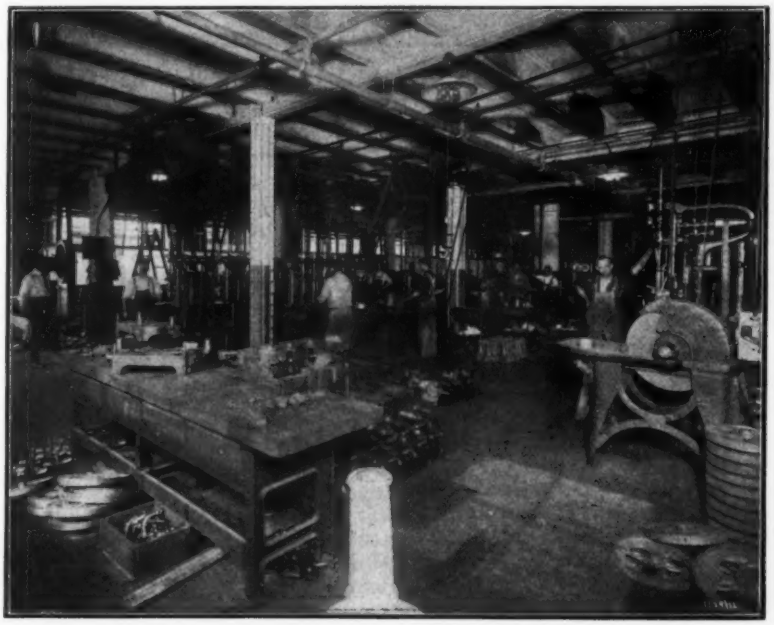
Nut-tapping machines are usually built in gangs of six spindles each. A time study shows that it required a man one minute and five seconds to put his foot upon the lever, raise the tap and place a nut in position. To place nuts under six spindles took nine seconds; to walk from the last spindle back to the starting point required five seconds, thus fourteen seconds have elapsed. By using the correct cutting speed, it required three seconds to tap a five-eighth inch nut. In other words each spindle ran idle eleven seconds. It is readily seen that one man cannot attend to six spindles and keep each cutting to its capacity. By placing two operators at each machine the output was increased 133 per cent.

Table II shows the cutting speeds at which the 17 machines in this department were found to be operating and the correct cutting speeds when the machines were equipped for motor drive.

TABLE II.

No. of Machine	Size of Nuts, Inches	Former Cutting Speed. Ft. per Minute	Correct Cutting Speed. Ft. per Minute
1	⅝	2.5	40
2	⅝	25	40
3	⅝	37.5	40
4	½	27	41
5	½	33.5	41
6	½	37.5	41
7	⅝	36	42
8	⅝	41	42
9	¾	21	43
10	¾	22	43
11	¾	23	43
12	¾	26	43
13	¾	34	43
14	⅞	21	44
15	⅞	23	44
16	1⅛	26	46
17	1¼	27	47

As was also true of the machines in the threading department, no two machines were operating at the same speed in the nut-tapping department, although the variation was not as great as in the former department. The same conditions were found in other departments. To make a long story short, through the increase obtained in the factory, this manufacturer



Group of Motor-Driven Bolt Headers.

Nut and Bolt Manufacturing Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant in Muskogee, Okla., operating 54 hours per week.
Total connected horsepower, 17. Total number of motors installed, 5. Average kilowatt-hours per month, 740.
Kilowatt-hour consumption for 7 months:
January, 700; February, 715; March, 916; April, 791; May, 668; June, 655; July, 663.
Load-factor, 8 per cent; operating-time load-factor, 19 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	3	1,800	Belted direct to one Buffalo 36-inch blower.
1	2	1,200	Belted to short line shaft driving six bolt-threading machines; and six nut-tapping machines.
1	2	1,200	Belted to shafting driving three bolt headers; two threading machines; and one emery wheel.
1	5	1,200	Belted to shafting driving one shaper; one milling machine; and two 1.5-inch bolt-threading machines.
1	5	1,200	Belted to shafting driving one lathe; one double emery; and one bolt cutter.

Plant operating 60 hours per week.
Total connected horsepower, 58. Total number of motors installed, 6. Average kilowatt-hours per month, 1,435.
Kilowatt-hour consumption for 12 months:
January, 1,490; February, 1,670; March, 1,480; April, 1,360; May, 1,340; June, 1,380; July, 1,370; August, 1,430; September, 1,570; October, 1,260; November, 1,880; December, 980.
Load-factor, 4.5 per cent; operating-time load-factor, 9 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	15	1,200	Belted to line shaft driving five lathes; one milling machine; one shaper; one planer; one drill press; three bolt cutters; two emery wheels; one large punch press; one drill press; and one wheel press.
1	15	1,200	Direct-connected to one cupola fan.
1	7.5	900	Direct-connected to one Chicago Pneumatic Tool Company air compressor.
1	10	1,200	Belted to line shaft driving six bolt-threading machines; two emery wheels; and two nut-tapping machines.
1	10	1,200	Belted to three No 2 Putnam bolt machines; two National bolt cutters; four 1.5-inch bolt headers; and six 0.75-inch bolt headers.
1	0.5	1,600	Direct-connected to one jig saw.

Plant operating 54 hours per week.
Total connected horsepower, 47.5. Total number of motors installed, 5. Average kilowatt-hours per month, 5,450.
Kilowatt-hour consumption for 10 months:
January, 6,270; February, 5,570; March, 5,920; April, 5,440; May, 5,480; June, 5,340; July, 4,970; August, 5,270; September, 5,030; October, 5,210.
Load-factor, 24.5 per cent; operating-time load-factor, 49 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,200	Belted to line shaft driving one 1.5-inch drill press; one 2.5-inch drill press; three bolt drills; one No. 3 milling machine; one speed lathe; two grinders; two emery wheels; and one hack saw.
1	7.5	1,200	Belted to line shaft driving one 16-inch lathe; one five-inch boring mill; one 36-inch planer; 12 No. 2 Putnam bolt machines; six National bolt cutters; eight bolt-threading machines; and one three-inch pipe machine.
1	10	1,200	Belted to line shaft driving 12 bolt-threading machines; one 8 by 8 air compressor; one eight-inch hydraulic press; one two-inch radial drill; one automatic knife grinder; one emery wheel; and four Putnam bolt machines.
1	10	1,800	Belted direct to one No. 16 Sturtevant blower.
1	15	1,200	Belted to a line shaft driving two emery wheels; two grind stones; three rod cutters; four No. 2 Putnam bolt machines; for one-inch bolt headers; four 1.5-inch bolt headers; four 0.75-inch bolt headers; and one elevator.

Commercial Practice
Management, Rates, New Business

ELECTRIC DISTRIBUTION-SYSTEM EXTENSION POLICIES.

By H. G. D. Nutting.

One of the most important questions in public-utility management is, "How far can we afford to extend our lines to take on business?"

Many different policies are being pursued by the central stations of the United States. It was demonstrated by an investigation in New England, and a similar investigation in Wisconsin, that there are nearly as many different rules as to extension policy as there are central stations. In view of the fact that this problem has been with the central station from the beginning of the business it is difficult to see why the practice has not been standardized within closer limits.

The general practice at present is to state that the estimated yearly gross revenue for one or more years, from a proposed extension, must be equal to or greater than the cost of the extension, not including meters, transformers and service drops. The fallacy of this rule is evident from the fact that the cost of operating a new extension is not a function of the partial investment alone, as will be shown in what follows.

This problem is governed by a natural law which cannot be broken without loss to both the central station and the community served. The law is, that the extension policy should be such as to make the natural development of the business the maximum continuous and ultimate possible for the benefits of both the central station and the community served. This abstract statement means nothing to the central-station manager in this form.

The question is, "What rule can be formulated that will produce the results of the operation of this law for any particular central station?"

Fortunately (and contrary to the belief of those who have not given the matter deep study) the problem lends itself to scientific analysis. This analysis follows. To get the matter plainly in mind, the result of the writer's investigation is given first and the methods pursued and explanation of limitations discussed afterwards. The result of the analysis is crystallized into the formula:

$$R = aI + bL + cM + dT + frK$$

in which R = the gross yearly revenue in dollars that must be received from the new extension to make it pay;

I = the cost of the extension in dollars, including meters, transformers, poles, wires and all apparatus required;

L = actual length of wire used in feet regardless of size of wire;

M = number of prospective meters or consumers to be connected;

T = number of transformers that will be required, regardless of size;

r = cost of one kilowatt-hour at station switchboard (including, say, 10 per cent profit);

K = estimated kilowatt-hours which will be delivered to extension per year.

a, b, c, d and f are variables which become constant for any given central station, in accordance with the following details.

a = the sum of the rates of interest, profit, depreciation and taxes for the particular utility, expressed as a decimal, thus:

Rate of interest and profit	0.075
Rate of depreciation on line	0.10
Rate of taxation	0.025
a =	0.200

b = cost per year of operating and maintaining one foot of wire regardless of size. This includes miscellaneous distribution system operating labor, miscellaneous distribution system supplies and expenses, and maintenance of overhead.

The value of b for any particular utility is arrived at by dividing the above annual distribution system expenses by the number of feet of wire operated, both primary and secondary. The result is an average figure which is close enough for the results desired.

c = cost per consumer (or meter) per year for meter and miscellaneous expenses. It includes labor of removing and resetting meters; labor of inspecting and testing meters; meter department supplies and expenses; maintenance of meters; consumption expenses, such as lamp renewals, consumers' premise expenses, etc.; commercial expenses, such as cost of collecting, reading meters, promotion of business, etc.; general expenses, such as salaries of general officers, law expenses, maintenance of general office, etc.; undistributed expenses, such as injuries and damages, insurance, utility equipment expenses, etc.

The value of c for any utility is arrived at by dividing the sum of the above mentioned expenses by the present number of consumers. It will be found that this is one of the largest factors in the formula. Its effect and limitations will be discussed further.

d = cost per transformer per year and includes labor of inspecting, removing, and resetting transformers; and maintenance of transformers.

d is arrived at by dividing the above expenses by the number of transformers in use.

f = one plus the average percentage of loss and unaccounted for in the distribution system expressed as a constant. Thus, if the loss is 30 per cent, $f = 1 + 0.30 = 1.3$.

Applying the formula to a proposed extension in a specific utility in which it was found that

$$\begin{aligned} a &= 0.20 \\ b &= \$\ 0.003 \\ c &= \$10.00 \\ d &= \$\ 1.50 \\ f &= 1.3 \\ r &= \$\ 0.015 \end{aligned}$$

it becomes

$$R = 0.2\,I + 0.003\,L + 10\,M + 1.5\,T + 0.0195\,K.$$

At first sight this formula will seem complicated. When it is realized that it is merely the sum of the various expenses contributing to the costs of operation of the new extension, its simplicity will be evident.

Application of the Formula.

A case is cited in which

I (the investment) = \$500.

L (the length of wire) = 5,000 feet.

M (the number of consumers) = 6.

T (the number of transformers) = 1.

K (the kilowatt-hours delivered) = 900 (estimated).

Then

$$\begin{aligned} R &= 0.2 \times 500 + 0.003 \times 5000 + 10 \times 6 + 1.5 + 0.0195 \times 900 \\ &= 100 + 15 + 60 + 1.50 + 17.55 \\ &= \$194.05. \end{aligned}$$

This means that, barring prospective further business from this extension, it cannot be made unless the six prospective customers will guarantee \$194 a year, or \$32.33 each.

How the Formula Was Developed.

Each new extension adds to the company's costs:

(1) Immediate Expenses—
- (a) Interest on investment in extension.
- (b) Depreciation on extension.
- (c) Maintenance costs of extension.
- (d) Operating costs of extension.
- (e) Consumption, commercial, general and undistributed expenses of extension.
- (f) Taxes on extension.
- (g) Cost of current delivered to extension, including operation and maintenance of power plant.

(2) Suspended Expenses—
- (a) Prorated interest on total plant.
- (b) Prorated depreciation on total plant.
- (c) Prorated taxes.

Interest, depreciation and taxes are functions of investment.

Maintenance and operating expenses are functions of length of line, number of consumers, and number of transformers.

General expenses are functions of the number of consumers.

Current cost is a constant (or practically so) for each individual plant.

In general the condition which determines whether or not an extension shall be made is, will the revenue pay the costs of service?

Let R = the estimated gross yearly revenue required from the extension at present rates.

E_1 = the immediate expenses resulting from the extension.

E_2 = the suspended expenses which go on whether the extension is made or not, except as a limiting condition.

Then $R = E_1 + E_2$.

Some question arises as to whether or not it would be proper to drop the term E_2. While, in the long run, this is as much a part of the expense of serving the new consumers as the old, its inclusion will seriously interfere with the development of the property. Unless the power plant and lines are loaded up to the limit of the requirements of good service, these suspended expenses exist whether the new extension is made or not. Therefore, if their inclusion prevents the taking on of consumers, they never can be reduced and the entire growth of the property is retarded. The answer is that it is better to have the new consumers to divide into the suspended expenses than to have the same suspended expenses and a dearth of consumers.

A further argument in connection with this question comes out of the fact that R, the gross revenue, is estimated at present rates and these rates are supposed to be high enough to take care of the present suspended expenses whether any more consumers are added or not. Of course this cannot be true in a plant having a large over-capacity.

In the immediate expenses are included all expenses that actually exist. They appear in the formula as averages of all the consumers now connected.

In view of the above facts, it is permissible and advisable to drop E_2 from the extension-policy formula and in the formula as shown this has been done.

Significance of the Terms and Their Limitations.

The formula is made up of two kinds of terms:

(1) Those which immediately add expense to the operation of the property. This includes the fixed charge on the investment and the kilowatt-hour expense; i.e., the first and last terms.

(2) Those which do not immediately increase the operating expenses with the addition of a few new customers, but which eventually do, with the addition of several hundred new customers.

The first term (aI) is the most evident cost of furnishing service to the new extension. The investment (I) is estimated after laying the new construction out on a map and taking off the quantities of the various materials. The factor (a) will vary with the year and the locality, although it will not be far from 0.20 at any time and any place.

The second term (bL) varies considerably in different cities. The value of b will run close to $0.003 per foot. If it is 50 per cent above or 50 per cent below this figure it does not affect the results materially.

The third term (cM) is a large part of the estimated cost of operating the extension. An inspection of the expense accounts which make up the value of c will show that they do not actually increase by the addition of a few customers. The consumption, commercial, general and undistributed expenses remain practically the same as before the extension was made. The meter expenses increase almost in proportion to the number of meters added. Inasmuch as the meter expenses are only 10 per cent of the total value of (c) their part is small. It is evident that this term could legitimately be dropped out entirely, or at least reduced to one-tenth of its actual statistical value. There is some question as to the policy in permitting it to appear, on account of its effect on the development of the business. In order that the formula be practical it must meet the conditions laid down in the natural law, stated in the early part of this discussion. This provides for an active development of the business both from the standpoint of increased customers and increased consumption. An increase of customers will gradually decrease the value of (c) although it will never get below a certain minimum value, probably in the vicinity of $5. In view of the above facts (c) can usually be made equal to $1.00.

The fourth term (dT) will appear only when a new transformer is to be included in the prospective extension. It contributes only a small part of the total cost of operating the extension. The value of (d) may vary from 50 cents to $5.00. In any case it will not affect the results much.

The fifth term (frk) should be selected with care as, standing alone, it represents the absolute minimum rate at which electricity could be sold without a continuous loss. The value of f (the per cent loss) can be fairly closely found for most stations. Even though it varies from 10 to 50 per cent it does not affect the results much. It will usually run from 20 to 30 per cent. (r) includes all the costs of generation at the power house and is arrived at by dividing the total cost of generation by the number of kilowatt-hours generated.

If the plant is loaded nearly to its limit, the interest, taxes and depreciation of the power plant should be included in the value of r. If there is plenty of surplus capacity, these fixed expenses should not be included. The explanation of this statement lies in the fact that, if the load-factor of the plant is low, every possible effort should be made to increase it, and the value of r in the formula has some effect on it.

It is not difficult to estimate the value of K in any particular problem. Ordinarily, for average residences, it will be anywhere from 140 to 180 kilowatt-hours per year.

It is interesting to apply the formula to the simple case of a service drop from a secondary line.

In this case

I = $10.
L = 100 ft.
M = 1.
T = 0.
K = 150.

Using the formula:

$$R = 0.2I + 0.003L + M + 1.5T + 0.0195K$$

$$R = \$2 + \$0.30 + \$1 + \$2.92 = \$6.22$$

which is the minimum amount the customer must pay annually to permit of the extension meeting its cost, not including consumption, commercial, general and undistributed expenses. If these latter are included the cost will be about $15.

It is evident from the foregoing that the degree of conservatism a company wishes to pursue is contained in the value of c used; c will vary from 1 to 15 in different cities, depending on circumstances, as set forth previously.

How to Apply the Formula to the Future.

No one can predict accurately the future. Knowledge of statistics and tendencies in certain sections of cities enables a manager to pass fairly reliable

judgment as to the number of customers that might be added in that territory in a certain number of years. The application of the formula to this condition will be illustrated by the following example.

Five applicants for service required the following conditions to be met in order to serve them:

$I = \$400.$
$L = 4{,}000.$
$M = 5.$
$T = 1.$
$K = 750.$

$R = 0.2 \times 400 + 0.003 \times 4{,}000 + 1 \times 5 + 1.5 \times 1 + 0.0195 \times 750.$
$= 80 + 12 + 5 + 1.50 + 14.63.$
$= \$113.13.$

Estimated income = $90.

This means that $23.13 a year would be lost on this extension.

If there is reason to believe that in three years, six more customers could be added without further line extensions, apply the formula to the extensions under these conditions as if they were immediate, thus:

$R = 0.2 \times 472 + 0.003 \times 4{,}600 + 1 \times 11 + 1.5 \times 1 + 0.0195 \times 1{,}650.$
$= 94.40 + 13.80 + 11 + 1.50 + 32.18.$
$= \$152.88.$

Estimated income = $11 \times \$18 = \$198$, which is $45.12 per year more than the cost of serving the eleven customers.

On the original extension for five customers the company would lose $3 \times \$23.13 = \$69.40$ in three years. Evidently from the above calculations, this loss (including interest) would be made up in approximately one and one-half years after the six additional customers came on. In view of this it is advisable to make the original extension for five customers notwithstanding the fact that the requirements of the first conditions are not satisfied.

The above formula is based on rational principles. It can be applied under almost every condition met with in central-station practice.

It should not be used indiscriminately. Any practical rule requires the exercise of fair judgment. The principal feature of a formula of this kind is that, if any changes or modifications are made in the terms, the conditions accompanying the change are completely known. Furthermore, the degree to which any factor may be changed is apparent, and the results can be anticipated.

Dayton Company Co-operates With Contractors.

The Dayton Power & Light Company, Dayton, O., thoroughly believes in co-operation between the electrical contractors, district representatives of manufacturers of electrical apparatus and the central station that arrangements have been made to hold dinners and meetings at least once every three months throughout the year, when they can all get together, talk over the business that has been secured, and plan for the future.

The first of these dinners was held at the Phillips House, in Dayton, on January 3, and about 30 attended as guests of The Dayton Power & Light Company. Sales Manager Thomas F. Kelly, of the Dayton Power & Light Company, acted as chairman of the meeting which followed, and told of the very successful year that the company had enjoyed in spite of the flood. He reported that the company had made an increase of 36 per cent in customers during 1913, which was an advance of 73 per cent over the 1912 new business.

Predictions of a still greater increase for 1914 were made because of the arrangement that has just been completed with the electrical contractors, whereby old homes can be equipped for electricity and payment for same made in monthly installments.

Suggestions for Courtesy to Customers.

The Edison Electric Illuminating Company of Boston has issued a booklet of "Things Worth Remembering," compiled by L. M. Wallace, auditor of the company. These booklets, from which the following valuable suggestions to employees are taken, have been distributed throughout the organization.

Always be courteous. Courtesy is an essential element in dealing with a customer—an asset worth acquiring.

Give the customer your whole attention; be as considerate with the small user of the Company's service as with the large one—accord just and equitable treatment to all.

Your promise to a customer is the Company's promise. A broken promise always hurts, and shows weakness and unreliability in the employee—every act should beget confidence.

Greet a customer pleasantly when he approaches, step aside and let him pass first through the door or into the elevator; if he asks for information, make your answers so clear that they will be of real help—from not being explicit come many misunderstandings.

That the customer may get a good impression, be dignified in deportment—don't be boisterous.

Because a thing was once so, do not assume that the fact has so remained just because you now think so; thus, when asked for information be sure you have it before you give it—investigate when in doubt, then report.

Having promised to do something by a certain time or in a certain way, do not start the thing a-going and trust to luck for the rest. Do your own part in full, then follow it up that you may know the rest is moving correctly—anything of importance needs attention.

It is a great mistake to give flippant answers even to stupid or insolent people.

From not listening intently to what is said, or not seeing correctly what is written, come nearly all inaccuracies—always be wide awake.

The finer the intellect you can rightly exercise, the more valuable will be your services to the Company; have the feeling of responsibility and endeavor to stand alone and complete your tasks effectively and lessen the necessity of being looked after—your reward will be in an exact ratio.

There are valuable positions always opening up in progressive concerns. Promotions go to the conscientious, intelligent worker. Responsibilities are imposed upon those who can "make good," and power comes to those who "know how"—be ready for a promotion.

Electricity in Church Service.

A novel use of electricity in church services was recently undertaken in the Broadway Baptist Church, Cambridge, Mass. The pastor delivered a sermon on "The Rescue of a Sinking Ship by Wireless" and the pulpit was fitted to represent the captain's quarters of a steamer. The pastor himself wore a captain's uniform, with gold braid and brass buttons. Wireless sending apparatus, placed in a distant part of the auditorium, announced a disaster, at the proper moment in the discourse, whereupon the "captain" impersonated a commander driving his ship at forced speed to the rescue of the disabled craft. At the close of the sermon a huge anchor studded with colored electric lamps was gradually illuminated until it shone forth resplendent as a symbol of hope.

Lomax Proposes Free Power for Manufacturers.

It is announced that the founders of the city of Lomax, Henderson County, Ill., in order to encourage the location of industrial plants, proposes furnishing power upon a unique basis. The city will give to each manufacturing plant free power for at least 90 years on the basis of one horsepower for each male employee, charging for additional power at the rate of $20 per horsepower per year.

The United Electric Light Company, Springfield, Mass., is advertising the advantages of good lighting, particularly window lighting. The company carries Mazda lamps in sizes from 15 to 500 watts, and urges the merchants of the city to start a good-lighting campaign as a part of their plans for securing new business for 1914.

Electric Sign Data

The Electric Sign as a Factor in Illumination.

When a merchant installs an electric sign he almost invariably confers a benefit on the public in addition to benefiting himself. An electric sign gives very good average illumination to the street in its immediate vicinity, and some figures on illumination from this source in Clark Street, Chicago, from Polk Street to the River, a distance of ten blocks, considerably less than a mile, show that the total number of lamps used in those ten blocks in signs in May, 1913, was 18,826; the wattage was 191,955, equivalent in 16-candlepower, 50-watt, carbon lamps to 3,260 lamps. If this equivalent was evenly distributed it would give nearly one 16-candlepower carbon lamp for every linear foot of street, or one for every two feet, counting each side of the street separately. The actual candlepower which went to increase the street illumination was, however, much greater, because a good many of the lamps were tungsten lamps, from which the light is more than twice as much for the same current consumption, even in the small sizes used in many signs. Consequently the street illumination from signs in these ten blocks of Clark Street, Chicago, was equivalent to an average of almost one 16-candlepower lamp to every linear foot on both sides of the street. The total candlepower of these signs alone would be equivalent to eight street arc lamps of 1,600 candlepower each per block for nine blocks; and on the basis of 0.108 watts per square foot of street surface, which is equivalent to the average intensity derived from the eight 1,600-candlepower arc lamps, the wattage used in these signs would illuminate 33 blocks.

It was estimated that an equivalent illumination, if provided by lamps maintained by the city for that purpose, would cost the city more than $1,200 per month, for illumination in this part of this particular street.

These figures mean a great deal when applied on a larger scale, the whole city being considered. There is an enormous number of electric signs in Chicago, although the example cited above is not claimed to be the average for business streets throughout the entire city, as that portion of Clark Street is almost the center of the business district, but these facts should be considered by local authorities everywhere when regulating the size and location of electric signs. Artificial illumination is one of the greatest safeguards which any community can employ against crime and criminals, and is also one of the greatest general features of attractiveness and good repute which the modern city possesses.

Thus the electric sign is an all-around benefit, compelling trade for the proprietor, and directly benefiting the community at large.

Electric sign constructed for a photographer and art store in an Eastern city by the Federal Sign System (Electric), Chicago, Ill.

The sign is of enamel construction, colored to represent paint on the palette. The name "Anschutz" is studded with lamps and the palette and brushes are outlined. There are a total of 115 five-watt lamps used.

No flashing effect is used, the lamps burning continuously.

No color effects are used for the lamps.

The sign is inexpensive and offers a suggestion for interesting the many photographers and art stores found in any city.

Electric Sign Progress in the South.

The Hotel Chisca, at Memphis, Tenn., the newest and largest hostelry in that city, and one of the finest in the entire South, has had the largest electric sign in Memphis erected on top of the building. The words indicated on the sign are "Hotel Chisca, Fireproof."

In Montgomery, Ala., the central-station company is selling on an average of six signs per month, and this without the aid of any special campaign or unusual sales effort. Special efforts will soon be made to interest billboard advertisers in illuminating their displays at night, using a new reflector which has recently been developed for this purpose.

At Beaumont, Texas, the central station has entered into a contract with the Beaumont Ad League covering the supply of current for a monster slogan sign to be installed at some conspicuous point in the city.

Electrical Construction

Planning Electric Lighting Installations.

The electrical contractor is frequently called upon not only to install the electric wiring in a new building, but also to determine what equipment will be necessary for the electric lighting of the rooms and the size of wires necessary for the purpose, and in some cases even the location of the outlets is left to his judgment. In fact, in many small installations he is called upon to act in the capacity of consulting engineer to the owner of the property, as the cost and importance of the installation are not sufficient to warrant calling in an expert engineer.

To give the best results to his customers and to build up a reputation for ability to do a satisfactory job under such conditions it is highly desirable that the electrical contractor should have good ideas as to appropriate methods for the electric lighting of the home, the small store, the factory and other common types of building. He should also know how to proceed to lay out a satisfactory installation and should have at hand the necessary facts and figures to determine upon the proper location and size of lighting units.

At the January meeting of the Chicago Section of the Illuminating Engineering Society a paper was presented by J. B. Jackson upon this subject, which should be of especial interest to both the electrical contractor and the architect. The material given below is taken from this paper:

It has not been uncommon in the past that provisions have been made for a certain number of outlets for an interior and the actual design of lighting equipment left until the building is practically completed. Very little consideration has been given in a great many instances to the factors which influence illumination results. This imposes conditions which are very hard to meet and the design usually becomes a matter of compromise. To obtain definite predetermined results it is necessary to know in advance the general scheme of decoration and the type of lighting equipment desired and provision made for its correct use.

Methods of planning lighting installations have scarcely kept abreast of recent developments. The high-power gas and the tungsten incandescent unit require somewhat different treatment than did the open-flame burner and the carbon incandescent units. Since the new sources have a very high intrinsic brilliancy, it is essential that they be removed as much as possible from the field of vision if we are to afford any protection to the human eye.

It is essential in considerations of light sources to have a clear conception of light as a quantity. It is unfortunate that the term candlepower has received such wide application, and every unit referred to in terms of its maximum candlepower, for this has given rise to some very erroneous conclusions. If we suppose a light source suspended in the center of a sphere in such a manner that all the light is intercepted by the interior surface and we make use of some method of either measuring or calculating the light inclosed within the sphere, we will then have a direct means of comparison of one light source with another. It is evident then that if light sources are expressed in terms of their average candlepower (otherwise called mean spherical) we may then make comparisons, since the last quantity always bears a definite relation to the total flux of light. A standard unit of luminous flux has been chosen, which is designated the lumen. It corresponds to 12.5 mean spherical candlepower.

TABLE I.—LAMP VALUES.

Kind of filament.	Horizontal or Nominal candlepower.	Watts.	Light units. (lumens)	Multiplying factor.
Carbon	2	10	21	4.59
Carbon	4	20	50	3.84
Carbon	8	30	96	3.02
Candelabra carbon	8	31.1	96	3.10
Gem	20	50	207	2.31
Gem	32	80	337	2.28
Tungsten	7.7	10	76	1.26
Tungsten	12.0	15	118	1.22
Tungsten	17.1	20	168	1.14
Tungsten	21.9	25	215	1.12
Tungsten	36.4	40	357	1.08
Tungsten	56.0	60	549	1.05
Tungsten	98.0	100	960	1.00
Tungsten	167.0	150	1637	0.88
Tungsten	278.0	250	2722	0.88
Tungsten	445.0	400	4535	0.85
Tungsten	556.0	500	5665	0.85

Table I is an evaluation of the different kinds of incandescent electric lamps which have been used or are in use at the present time. The first column gives the common designation as to kind of filament. The second gives the nominal candlepower taken in the horizontal direction. The tungsten or Mazda units have usually been expressed in terms of watts consumed, hence their horizontal candlepower values are not so commonly known. The third gives the power consumption expressed in watts. The fourth column contains the value of the lamps in terms of light units (lumens) as referred to above and may be taken as a measure of the illuminating value. In the last column is tabulated a multiplying factor to be used in connection with a later table, as will be explained. In the consideration of this table it should be remembered that these values apply to the quantity of light given off by the lamp when not equipped with reflectors, globe or other accessory.

The next question which naturally arises is, how are we to determine the amount of light on any surface, also how are we to obtain a measure of the light required for certain classes of service. If a standard be chosen which will represent a certain flux density, then it is possible to measure by means of photometric apparatus any flux value in terms of this standard. This standard has been given the name foot-candle and should be considered as being independent of the source of light and the distance from the source and as being only a measure of the density or intensity of the illumination produced.

The values of illumination intensity considered satisfactory vary in different observers as much as 5 to 1. Table II gives the values in foot-candles for different classes of service which are average values obtained in installations which have been classed as satisfactory. It has often been stated that one system of lighting requires less intensity than another, but there are not sufficient authoritative data along this line to warrant any such assertion. Regarding the most recent tests, the United States postal car specifications contain the requirement that the illumination shall be from 2.25 to 3.50 foot-candles, this value being comparable to the requirements for desk and office purposes. Relative to intensities required, there seems to be considerable tendency to require more and more

TABLE II.—FOOT-CANDLE INTENSITIES RECOMMENDED FOR VARIOUS CLASSES OF SERVICE.

Type of Building.	Foot-Candles
Armory	2.0
Art Gallery (walls)	5.0 to 10.0
Auditorium	1.0 to 3.0
Automobile Showroom	3.0 to 6.0
Bank (general)	2.0 to 3.0
Bank (desks)	4.0 to 6.0
Billiard Room (general)	0.8 to 1.5
Billiard Table	6.0 to 10.0
Cafe (general only)	2.0 to 4.0
Cafe (with table lamps)	1.0 to 2.0
Card room (tables)	2.0 to 3.0
Church	1.0 to 2.5
Drafting room	6.0 to 12.0
Desk	4.0 to 6.0
Engraving	10.0 to 12.0
Factory (general only)	0.8 to 1.5
Local Bench (fine work)	5.0 to 10.0
Local Bench (coarse work)	3.0 to 5.0
Gymnasium	1.0 to 3.0
Hotel—	
Bedroom	1.5 to 2.0
Corridor	0.6
Dining Room (general)	2.0 to 4.0
Dining room (lamps on tables)	1.0 to 2.0
Lobby	2.0 to 4.0
Library—	
Stack Room	1.6 to 2.0
Reading Room (general)	3.0 to 4.0
Reading Room (with local)	0.7 to 1.5
Offices—	
Small Office (private)	3.0 to 4.0
Small Office (general use)	3.0 to 6.0
Large Office (general illumination)	3.5 to 5.0
Large Office (with desk lamps)	1.5 to 2.0
Residences—	
Hall	0.7 to 1.0
Parlor	1.0 to 3.0
Living Room	1.5 to 2.5
Library	2.0 to 4.0
Dining Room	2.5 to 5.0
Kitchen	2.0 to 3.0
Laundry	1.5 to 2.0
Bedroom	1.0 to 3.0
Bathroom	2.0 to 3.0
Store and Furnace Rooms	0.4 to 0.8
Stores—	
Clothing	4.0 to 7.0
Dry Goods	4.0 to 7.0
Furniture	2.0 to 4.0
Grocery	2.0 to 4.0
Hardware	2.0 to 4.0
Jewelry	4.0 to 6.0
Millinery	4.0 to 6.0
Shoes	2.0 to 4.0
Stationery	2.0 to 4.0
Warehouse	0.5 to 1.0

light. In other words our standards of illumination are rising gradually. It will be noted that the values given in the table are in ranges, such as 2 to 4 foot-candles, being given in this manner to allow some opportunity for the designer to make a choice according to his knowledge of the service required.

There are two classifications of fixtures in general use at the present time, namely ceiling and bracket. Of these the ceiling fixture is much more efficient as a lighting unit. With the spacing of ceiling outlets placed in the center of approximate squares we approach the nearest to the condition of uniform illumination, which is considered to be ideal. The use of bracket fixtures for general illumination is not to be recommended and these should be used only when some consideration is given to special or decorative features. In commercial work, it is safe to state that the bracket fixture has very limited application. Fixtures of this type have often been installed and the reason for doing so advanced that they can be used for connection for fans, portable lamps, etc. This is not to be encouraged, as baseboard and floor receptacles make a much more convenient and sightly connection and as a general rule a cheaper installation cost. If sufficient capacity were installed for bracket fixtures for general illumination the center of the room would be darker than near the walls. Under these conditions objectionable glare almost always is introduced, as the usual bracket is much too low for use under these conditions.

As stated above, the most even distribution of light is obtained by the use of ceiling units, spaced in the center of squares or rectangles approaching squares. The sizes of these squares is determined by the architectural features of the building, such as dimensions of bays and ceiling height. Table III shows desirable sizes of squares for location of ceiling outlets under different ceiling heights and for different classes of buildings. The collection of dirt and dust affects different reflectors in varying degrees. If we set 15 per cent as the allowable depreciation on lamps and reflectors, the cleaning period would be six weeks for indirect units, prismatic, light and medium-density opals; and 16 weeks for steel and heavy-density opals.

The contractor can accomplish a great deal by impressing upon his customer the necessity of regular cleaning periods. It is not uncommon that installations have been known to be allowed to go without cleaning for a period of more than a year. Such an installation might give about 25 to 50 per cent of its initial value.

The light which we obtain on the working plane is composed of three parts, the light received directly from the unit, plus a portion of that directed towards the walls, plus a portion of that directed toward the ceiling. It is evident therefore that color of walls and ceiling very materially affect the total illumination from a given lighting unit as color is an indication of the absorption of light, i. e., the darker the color sensation the higher the absorption value. An exception to this rule is afforded by units which direct practically all of the light toward the working plane.

In planning a lighting installation it is essential to consider all the quantities which affect the illumination results, namely, architectural features, intensity required, kind of lamp (such as tungsten incandescent), type of accessory equipment, decorations, etc. In order to simplify matters as much as possible a table has been made up containing all these variables excepting the intensity required for the service. In doing this it has been necessary to assume a lamp for general use for this purpose; the 100-watt tungsten lamp of the January, 1914, rating has been selected. In making calculations average lamp depreciation of 3.6 per cent has been allowed for; it may be stated, however, that the large sizes of lamps will give somewhat higher results while the smaller will give lower. For the exact values of other lamps multiply results in the table by the number given under multiplying factor in Table I.

Below Table IV are given three colors under each of the classifications, Light, Medium and Dark. These are given as a guide for classifying the different conditions of ceiling and walls.

As an example of the method of calculation, assume the following conditions:

Width of space.....40 feet
Length of space.....60 feet
Ceiling height .....11 feet
Ceiling color .....light
Wall color .....medium
Service requirement, general office illumination without desk lamps.
Type of the equipment, medium-density opal.

Then proceed as follows:

TABLE III.—DESIRABLE SIZES OF SQUARES.

Kind of Room	Ceiling Height in Feet	Desirable Length of Side of Square
Armories	12 to 16	12 to 16
Auditoriums	12 to 16	12 to 16
Public halls	over 16	15 to 26
Rinks	over 16	15 to 26
Stores	8 to 11	8 to 11
Stores	11 to 15	10 to 16
Stores	over 15	14 to 22
Offices with desk lamps	10 to 20	12 to 18
Offices without desk lamps	9 to 12	7 to 11
Offices without desk lamps	12 to 16	9 to 14
Offices without desk lamps	over 16	11 to 18

TABLE IV.— WATTS PER SQUARE FOOT TO PRODUCE ONE FOOT-CANDLE ILLUMINATION (Watts per Lumen).

Type of Lighting Equipment	Ceiling Light—Walls Light	Ceiling Light—Walls Medium	Ceiling Light—Walls Dark	Ceiling Medium Walls Light	Ceiling Medium Walls Medium	Ceiling Medium Walls Dark	Ceiling Dark—Walls Medium	Ceiling Dark—Walls Dark
Mirror (bowl-type direct)	0.18	0.19	0.20	0.18	0.19	0.20	0.20	0.20
Prismatic (clear)	0.18	0.20	0.21	0.22	0.24	0.26	0.26	0.27
Prismatic (satin finish)	0.23	0.25	0.28	0.26	0.28	0.31	0.31	0.34
Prismatic (velvet finish)	0.20	0.22	0.24	0.22	0.24	0.25	0.28	0.28
Opal Inclosing Unit	0.30	0.33	0.36	0.38	0.37	0.42	0.49	0.54
Prismatic Inclosing Unit	0.22	0.23	0.24	0.24	0.25	0.28	0.30	0.31
Opal Reflector (heavy density)	0.20	0.21	0.22	0.22	0.22	0.23	0.23	0.23
Opal Reflector (medium density)	0.22	0.23	0.25	0.24	0.25	0.28	0.29	0.30
Opal Reflector (light density)	0.23	0.25	0.28	0.26	0.28	0.31	0.31	0.33
Enameled Steel (dome-shaped)	0.20	0.22	0.22	0.21	0.22	0.22	0.22	0.22
Enameled Steel (bowl-shaped)	0.22	0.23	0.24	0.23	0.24	0.24	0.24	0.24
Semi-indirect	0.25	0.28	0.32	0.39	0.41	0.47	Not recommended	
Indirect (mirror reflector)	0.35	0.39	0.41	0.51	0.57	0.63	Not recommended	
Bare Lamp	0.27	0.31	0.37	0.31	0.37	0.43	0.45	0.51

COLOR CLASSIFICATION.

Light	Medium	Dark
White	Yellow	Green
Cream	Light Buff	Red
Light Gray	Light Blue	Brown

Area 40x60 or.....2,400 square feet.

From Table IV, the constant for medium-density opal with light ceiling and medium walls in 0.23 watt per square foot required to produce one foot-candle illumination.

From Table III, 10 feet spacing of units is the best adapted for the given ceiling height and dimensions of the space considered.

Number of units, 24.

Area per unit, 100 square feet.

From Table II, the intensity required for office purposes under the conditions named is 4.0 foot-candles.

Watts per square foot is given by 4.0x0.23 or 0.92.

Allowing for depreciation 15 per cent, 0.92x1.15=1.06 watts per square foot to be provided, or 106 watts per outlet.

As an example of the use of other types of incandescent units, if it were desirable to use candelabra carbon lamps, reference to Table I shows that the 100-watt value obtained when using tungsten lamps must be multiplied by a constant tabulated in the last column, namely 3.10, from which it is evident that to obtain the same illumination results it is necessary to use 310 watts in the lamps designated.

Relative to the final design of lighting fixtures the manufacturers of equipment have available very comprehensive publications showing in detail sizes, shapes, and designs of all their products. These will be found of great value in making distinctive designs and no difficulty should be expreienced in procuring fixtures to conform with any architectural treatment which is considered advisable.

To summarize, the steps to be taken in planning a lighting installation are as follows:

(1) Determination in a general way of the type of the lighting to be used, including decoration and kind of unit.

(2) Spacing of outlets from architectural considerations.

(3) Intensity required.

(4) Calculation of capacity of outlets from Tables II and IV.

(5) Necessary wiring installation.

(6) Final selection of fixtures with reference to mounting height, selection of accessories (glassware, etc.) and general design to conform with architectural treatment of buildings.

Co-operation in Louisville.

The Louisville Gas & Electric Company, of Louisville, Ky., is keeping the electrical contractors of that city busy during an unusually quiet period through its house-wiring campaign. The Louisville Gas & Electric Company is playing no favorites in this connection, but is distributing the work among the various contractors, so that each is feeling the benefits of the campaign. Large-size newspaper copy is being run by the company, and this, in connection with the active campaign of solicitation which is carried on, is producing results in the way of new business.

Show-Window and Display Lighting.

At the meeting of the Western Association of Electrical Inspectors held at Cincinnati, O., last week, the following report was made by the Committee on Show-Window and Display Lighting. This committee consisted of: J. Faucault, C. W. Francis, H. C. Henly, A. M. Paddon, W. E. Skead, E. J. Stewart and E. P. McGough, chairman.

Permanent Lighting in Show Windows.

It must be apparent to electrical inspectors that considerable progress has taken place in the methods of wiring and illuminating show windows since our Association, through its Commitee on Show-Window and Display Lighting, first began its investigation of this subject over eight years ago.

Important modifications in the design of show-window inclosures, advancement in the art of their illumination and the adoption of more permanent methods in the work of installing the necessary electrical equipment, have contributed their share in bringing about the improvement noted. The adoption of the "box" type of show window, by restricting the area of the inclosure to the actual needs of the situation, has simplified, to a great extent, the problem of its successful illumination. The removal of the lights from the sides to the ceiling of the window box has eliminated the danger incident to the presence of lamps and sockets in the immediate vicinity of inflammable material, and has demonstrated the superiority of hidden over exposed light sources, in the production of efficient and effective illumination, while the adoption of metal-armored construction in show windows has, by reason of its unobtrusive appearance and lasting qualities, improved the looks and added to the permanency of the installation.

As the safety of an installation is largely dependent on the proper installation of suitable and approved appliances, a brief analysis of the various systems of show-window lighting, which are now considered standard, will not be out of place. Approved devices, specially designed to meet the needs of show-window construction, are now available in a great variety, so there is no longer any necessity for using unapproved and ill adapted appurtenances for the purpose.

The lighting of show windows by means of trough reflectors placed in the upper portion of the inclosure, close to the glass and arranged to throw the light downwards, is one of the popular methods in vogue. In some trough reflectors the reflecting surface is of metal, but as a rule, silvered and enameled glass with a corrugated surface is used for this purpose. Trough reflectors are usually provided with twin or angle sockets, arranged so that the lamps will lie parallel with the surface of the reflector. The use of double-ended porcelain receptacles, which permit of the reflector being wired on the loop system, is preferable, as it does away with the necessity for taps and splices and allows conductors larger than No. 16, B. & S. gauge, to be used throughout. The use of such sockets derives a further advantage from the fact that, under the rules of the National Electrical Code, 32 sockets or receptacles, when connected directly to No. 14 B. & S. gauge, approved rubber-covered wire, may be installed on one circuit, provided the wattage does not exceed 1,320 watts. In some types of trough reflectors, the sockets are held in place by "socket fingers" attached to the surface of the reflector. This method is objectionable on account of the wires being exposed at each socket. The use of trough reflectors which provide for a complete inclosure of the wires will alone meet the requirements of the Code.

The use of tubular lamps affords an opportunity for more compact design in trough reflectors without decreasing their efficiency. One type of trough reflector contains specially designed tubular lamps arranged so that they can be operated in series on an incandescent lighting circuit or in multiple on a low-voltage transformer, the primary of which is connected to the lighting circuit.

On account of the heat developed in the trough reflector by reason of the close proximity of the lamps to the surface of the reflector, the life of the rubber insulating covering on the wires is considerably reduced. This is especially true of certain types of show-case reflectors which, however, are sometimes used to illuminate small show-window inclosures. In reflectors where the wires are subjected to a temperature in excess of 120 degrees Fahrenheit, from the heat of the lamps, slow-burning wire must be used in order to comply with the provisions of the Code.

In addition to trough reflectors there are various types of reflector shades which are specially adapted for show-window lighting. These reflectors are often made entirely of metal, but the more efficient types are constructed of

silver-plated glass, or of metal with a silver-plated glass lining. Some of these reflectors can be readily attached to a socket or receptacle; others, on account of their weight, are designed to be supported independent of the socket shell. When the sockets and reflectors are combined in one device and provided with an extension of armored cord, care should be exercised to see that the proper connecting fittings are used where the cord enters the reflector and the attachment plug. Unsatisfactory lighting systems can very often, with little effort, be immensely improved by the use of such reflectors; hence their popularity.

The placing of lights in receptacles above the window box with apertures cut into the box to permit the light to shine down on the goods below, the lamps being located in reflector-type shades, is another method resorted to with success. The protection of the wiring above the window box and the affording of proper ventilation for the lamps, are matters that should not be overlooked in this type of installation.

The lighting of show windows by means of exposed lamps around the window border, is a method that is gradually going out of use. It is by far the most inefficient scheme for lighting a show window ever devised, for it actually accomplishes the reverse of that for which it is intended; it hinders rather than aids a prospective customer in seeing the goods on display. However, the most serious objection to this system of lighting arises from the fact that the lamps and sockets, by reason of their location, are subject to breakage and liable to come in contact with the inflammable merchandise on exhibition. To secure a measurable degree of safety with this system, sockets and receptacles of the most rigid type, in connection with metal-armored construction, should be used.

From the standpoint of efficiency or safety, show windows lighted by stem fixtures suspended from the ceiling have little advantage over those lighted around the border. A large chandelier in a show window will, as a rule, attract more attention from the onlooker than the merchandise displayed. Enterprising fixture establishments frequently take advantage of this fact to advertise their goods by arranging for the exhibition of sample fixtures, bearing their advertisement, in other men's show windows. It is needless to ask who reaps the greater advantage from this arrangement. As such fixtures are changed at intervals, it usually leads to the introduction of temporary connections, lamp cord, key sockets and other features objectionable in show windows. The ordinary brass fixture is not suitable for show-window lighting. Being composed of many parts, it is easily deranged and, therefore, subject to short-circuit and grounds. The socket is usually a weak point in such fixtures. This is especially true where heavy shades are used, the weight of the shade tending to force the socket shell loose from the cap. Notwithstanding this, contractors, through carelessness, frequently install key sockets which are sure to come loose and thereby introduce the danger of exposed live contacts. Shade holders, which are not dependent on the socket shell for support, are an indispensable adjunct in connection with fixtures designed for show windows, unless approved one-piece sockets or those of an equally rigid type are used.

The 1913 Code contains a modification of the rule prohibiting the use of lamp cord in show windows except when provided with an approved metal armor, by permitting an exception to be made in the case of chain fixtures when authorized by inspection departments under special permission in writing. The conditions that should determine the acceptance or rejection of such fixtures in show windows are, therefore, deserving of serious consideration at our hands.

Temporary Lighting in Show Windows.

The restricted area of the average show window, the highly inflammable character of the decorations and the carelessness and ignorance usually displayed by those entrusted with the work of installing the electric wiring, has impelled inspection departments in general to look with considerable disfavor on the introduction of temporary wiring and lights in show windows.

In view of the restrictive measures that are being generally adopted in respect to the use of electrical apparatus, in places where the life hazard is on a comparative equality, such as theaters, it would seem that a further realization of the dangers involved will result in the enactment of similar laws for the regulation and control of the hazard in question.

However, in the absence of any ordinance dealing specifically with such risk, much may be accomplished towards bettering conditions by well directed and persistent publicity. The furnishing of information on this subject in comprehensive and concise form, by means of press notices and letters addressed to the merchants (as practiced by our association in dealing with the "holiday-display" hazard), has already borne excellent fruit. The adoption of such methods is, therefore, strongly endorsed.

Ordinary Display Lighting.

The proper lighting of stores and show rooms, in which dry goods and similar inflammable merchandise is placed on display, is a matter of considerable importance to the merchant. Failure on his part to provide adequately for this important requisite is a serious handicap in many respects. For a poor system of lighting will not only detract from the appearance of his store and prevent him from exhibiting his goods to advantage, but it will also, according to competent authority, exert an injurious influence on the well being and, consequently, on the efficiency of his employees.

Here, as in show-window lighting, safety and efficiency are the prime considerations and here also, do we find that the means, necessary to the procuring of these important essentials, are in a great measure identical.

The use of low hanging fixtures, pendants and brackets over the aisles and counters, constitutes the prevailing cause for most of the trouble that arises on installations of this character. On account of their position, they are liable to injury and subject to all kinds of abuse. The effectiveness of the lights is largely counteracted by reason of their location. Being shaded by pyramids of merchandise, or intervening show cases, they contribute little to the general illumination of the store or show room. Moreover, as the lamps are situated in the line of vision, any attempt to improve the lighting conditions by raising their candlepower only increases the accompanying glare, thereby adding to the discomfort of the clerks and patrons.

The most effective remedy for these conditions consists in elevating the light sources to positions where they will be practically out of danger and, therefore, to a great extent out of view. Of course, this must not be regarded as a panacea for all of the evils that are liable to creep into the average display lighting installation. That it will dispose of the greater number of them, however, and conduce to a much higher degree of safety and efficiency, has been demonstrated by actual observation.

Among the Contractors.

A voluntary petition in bankruptcy was filed last week in the United States District Court at Chicago by Nels O. Nelson and Noah Greening, electrical contractors of Aurora, Ill. The total liabilities amounted to $2,508 and the total assets are stated to be $1,565.

The Star Electric Supply Company, of Waco, Tex., has the contract for the rewiring of the Provident Building, which will henceforth be known as the Peerless Fire Insurance Building.

The Eugene Ashe Electric Company, of Fort Worth, Tex., has moved to its new store at 107 West Ninth Street.

A. S. Schulman, 417 South Dearborn Street, Chicago, has just completed the entire wiring of the new Hotel Gibson, in Cincinnati, O. The new hotel occupies the site of the old and favorably known Hotel Gibson, which was destroyed by fire last year. This magnificent hotel has 500 rooms and is thoroughly equipped in the most modern style in which electric lighting and auxiliary electrical devices are very liberally used. All of this installation was made by Mr. Schulman's firm.

The Grossman Electric Company, 1532 South Fourth Street, Philadelphia, Pa., is sending out to its friends a very attractive calendar for 1914, incidentally calling attention to the fact that it is a member of the Society for Electrical Development, and besides house wiring on the easy-payment plan it has a very extensive trade in electrical appliances and devices of all kinds.

D. R. Kerr has recently established an electrical contracting business at 724 Commercial Street, Emporia, Kans.

Among the contracts for electrical work recently completed by the Central Electric Company, of Waco, Tex., are the new four-story building of the Behrens Drug Company, the new Masonic Temple, and all the electrical work in connection with the new city filtration plant, including wiring for both lamps and motors.

The Newton Electric Shop of Newton, Kans., of which J. H. Warhurst is proprietor, has just completed the wiring installation in the new Newton High School. Another contract recently completed by this firm was that of wiring the new City Auditorium in Newton.

The National Electric Company, Baltimore, Md., has been awarded a contract for wiring the storage building of the Crown Cork & Seal Company, at Highlandtown, Md.

The Craig Electric Company, of Hillsboro, Tex., has recently completed the wiring of the new $65,000 First Methodist Church of Hillsboro.

M. W. Schottler, electrical contractor of Emporia, Kans., is doing the wiring on the remodeled Emporia State Bank Building.

The Vesey Electric Company, of Waco, Tex., is just completing the electrical installations in the new Pretorian Building, the new Waco Hotel, and the North Waco High School. This company also has under way the electrical work in the new Hill's Business College Building.

John Mueller, Jr.

One of the most active and up-to-date contractors in the Electrical Contractor's Association of the State of Illinois is located in the city of Ottawa, and is president of the Mueller Electric Company doing business at 818 La Salle Street in that city. This man is John Mueller, Jr. He was born in Peru, Ill., on July 27, 1881, the son of John Mueller and Elizabeth Trost. His father is associated with him in business as vice-president of the company. The firm started in La Salle, in 1903, but discerning a broader field for business in Ottawa, the company moved to that city June 1, 1912, and since that date has been doing a thriving business. While electrical contracting is a specialty of this company, which is incorporated under the laws of Illinois, a considerable business is also carried on in handling electrical supplies and fixtures. The company originates its own designs of fixtures and a varied assortment of beautiful designs is always to be seen in the show-room of the store. A very attractive display is afforded by the line of fixtures and glassware which is constantly kept in stock.

John Mueller, Jr.

On September 19, 1905, Mr. Mueller married Bertha Henry, and Mrs. Mueller now acts as secretary and treasurer of the company. Mrs. Mueller was born in France. She shows her interest in electrical matters by accompanying her husband to the conventions of the State Association. Mr. and Mrs. Mueller reside in Eastwood, a suburb in the extreme eastern part of Ottawa.

Of the social and fraternal societies, Mr. Mueller is a member of the Knights of Columbus, the Elks and the Royal Arcanum. He is a member of the Committee on Liability Insurance of the Electrical Contractors' Association of the State of Illinois.

Iowa Contractors Form State Association.

The electrical contractors in the state of Iowa met to organize a state association at Waterloo on February 2. H. R. Plowman acted as temporary chairman of the meeting, and M. T. Humphrey as temporary secretary.

G. W. Hill, special representative of the National Electrical Contractors' Association, was sponser of the organization and much credit is due to him for the success of this organization movement. Mr. Hill has worked incessantly for the past month and was successful in bringing together a representative body of electrical contractors.

W. J. Collins, of Chicago, was appointed to take charge of routine matters of organization. The temporary chairman appointed at the morning session a Committee on Constitution and By-Laws consisting of George O. May, C. S. Abell and Edward Kunkel, with instructions to report at the afternoon session.

W. J. Collins pointed out the use, necessity and value of an organization. In outlining the work that such an association might accomplish, Mr. Collins took up and discussed in particular a state license for electrical contractors, local associations, business education and liability insurance.

The following officers were elected:

President, W. C. McCarten.

Vice-president, Floyd A. Wallace.

Secretary and treasurer, M. T. Humphrey.

Board of Directors: George O. May for one year, Edward Kunkel for two years, and Frank Sabin for three years.

The following committees were appointed: Legislative Committee: Floyd A. Wallace, G. A. Chaudoin, H. J. Ryan; on Liability Insurance: George O. May, C. H. Kellar, J. A. Hartlup; on Membership: Edward Kunkel, C. S. Abell, Charles Braman.

The following contractors became charter members of the Association: L. L. Cory; H. J. Ryan Electric Company; W. L. Fowler; Electric Supply Company; T. S. Ward; E. W. Lane; Martin Smedes; G. A. Chaudoin, Citizens' Electric Company; King Plumbing Company; Townsend Electric Company; C. G. Bosch; H. T. Schmidt; E. G. Brown; Iowa Electric Company; McCarten Plumbing Company; C. H. Kellar; C. E. Mackey; G. T. Western Electric Company; A. W. Carrol; Waterloo Electrical Supply Company; C. H. Braman; L. B. Talor; B. H. Electric Company; Hitchcock & Humphrey; Tri-City Electric Company.

Until 10 years ago the electric street railway and electric light were unknown in China.

Public Service Commissions

CALIFORNIA.

The Pitt River Power Company, supplying electricity in and around Burney Falls, Shasta County, was authorized to issue $90,000 par value of preferred stock; $30,000 in payment for a hydroelectric site and $60,000 to cover the cost of constructing a hydroelectric plant. The latter amount of stock is to be issued only after applicant has filed a detailed statement of proposed construction expenditures approved by the Railroad Commission.

MARYLAND.

The Maryland Public Service Commission has submitted the annual report for the year 1913. The report contains a review of the important cases handled during the year, and an outline of prospective work. The most important case completed in the last year was the rate case of the Consolidated Gas Electric Light and Power Company of Baltimore. This investigation caused a total outlay of $24,129.57. The preliminary details for the valuation of the properties of the United Railways and Electric Company of Baltimore, and of the Chesapeake and Potomac Telephone Company of Baltimore are practically completed. These are very large and important matters, involving the question of just and reasonable rates. The telephone investigation covers the whole state. In view of the heavy cost of making such extensive investigations and the danger of crippling the other work of the Commission in attempting to push these urgent matters to completion, the Commission suggests that the Legislature make special appropriations for such investigations.

NEVADA.

The Public Service Commission has issued an explanatory statement setting forth the reason for issuing an amended order in the case, City of Ely vs. Ely Light and Power Company. In view of additional information received subsequent to the original order, the majority of the Commission concurred in the amended order, fixing rates higher than those prescribed by the original order. The majority of the Commission now affirm, in answer to the dissenting opinion prepared by their associate, that the rates in the original order would have reduced the earnings of the company to the very line of confiscation, if not actually crossing it. "Suit had been brought by the company in the First Judicial District Court of this State, and the enforcement of the order had been restrained. It was obvious, to the majority of the Commission at least, that, upon the showing made, neither that court, nor any other in the State of Nevada would sustain the order." The order was modified so as to prescribe a rate of 17 cents per kilowatt-hour for the first 50 kilowatt-hours per month; 16.5 cents per kilowatt-hour for the next 100 kilowatt-hours per month; 15 cents per kilowatt-hour for the next 100 kilowatt-hours per month; and 12.5 cents per kilowatt-hour for all in excess of 250 kilowatt-hours consumed per month. The minimum charge is $1.50, as in the original order.

NEW JERSEY.

The Board of Public Utility Commissioners has denied the petition of the New Jersey Power Company to issue $75,000 of its capital stock for the construction of transmission lines from Boonton to the vicinity of Dover, by way of Fox Hill and Denville, the electric energy in part to be used by the Morris County Traction Company. The Board points out that the power company is not itself a public utility as defined by the act regulating such companies, while furthermore, its charter expressly subjects its power to the limitation that none of its property shall be devoted to a public use. In its decision the Board says: "Without in any wise impugning the good faith of the petitioner, it appears clear that the arrangement in the furtherance of which they desire to use the proceeds of this stock is one that lends itself admirably to the purpose of those who might be bent on escaping the control which the law of this state seeks to throw around public utilities generally. Where the generating company is not a public utility and, therefore, is exempt from the regulation designed for such, and when the electric current transmitted by the transmission company is generated by a concern not under public regulation and control, how can this Board exercise the power conferred upon it by the statute?"

NEW YORK.

In recognition of the professional abilities of Alfred Craven, chief engineer of the Public Service Commission for the First District, and also in recognition of the immense amount of work he has to direct in the supervision of construction of the Dual System of Rapid Transit, the Commission has increased his salary from $15,000 to $20,000 a year. It also authorizes an increase in the salary of Robert Ridgway, engineer of subway construction, who is Mr. Craven's chief deputy in the Dual System work, from $10,000 to $12,000. It is interesting to note that this increase places the salary of the chief engineer $5,000 higher than the salary of a member of the Commission.

Frank H. Bethell, vice-president of the New York Telephone Company, has submitted a proposal to the Public Service Commission for the Second District, which allows the Commission to appraise the telephone company's property as a basis for rate making. The company will foot the expense bill, which may amount to $200,000.

The Commission is to have undisputed control of the undertaking. Chairman Decker regretted that the work could not be done without using money furnished by the telephone company, but neither the city nor the State would stand the expense.

OREGON.

The Oregon Railroad Commission is making a complete valuation of all property of the Portland Railway Light & Power Company, as a basis for a revision of its schedule of rates for street railway and power and light service.

WISCONSIN.

The Railroad Commission has determined the just compensation to be paid by the City of Manitowoc in taking over the Manitowoc electric light plant. After considering the valuation of the engineers in the light of the contentions of the interested parties, the Commission fixed the cost of reproducing the plant new, exclusive of materials and supplies, at about $166,668, and the present value, $127,-

301. In conclusion, the decision says that there are several elements besides the original cost, the original cost less depreciation, the cost of reproduction and the cost of reproduction less depreciation, that should be taken into consideration in arriving at a fair value of the property under appraisement. "These include among other things, the outstanding indebtedness, the gross and net earnings of the plant, and the cost or value of the business the plant has acquired, or its going value. Considering these elements and all other factors that must be considered under the law in arriving at a fair and just value, it seems that $137,500 would be a just compensation to be paid by the city of Manitowoc for the property in question."

A recent decision rendered by the Commission made certain changes in the telephone rates charged by the Farmers Telephone Company of Beetown. The order also contained service regulations and specified that the company's half of the trunk line between Platteville and Lancaster be made full metallic as soon as the Platteville, Rewey and Ellenboro Telephone Company agrees to build its half of the line. The rate schedule is not to be put in effect until such changes of management and organization, including changes in accounting, methods and procedure, are made as required by the Wisconsin Railroad Commission.

The Endeavor Electric Light and Power Company was granted authority to increase its rates. The rates authorized are 15 cents per kilowatt-hour for the first 30 kilowatt-hours per month and 10 cents per kilowatt-hour for the excess. The investigation showed that the utility is operated at a loss under the present rates, and that even the rates proposed by the utility will probably be insufficient to cover depreciation and other operating expenses. The plant is operated in connection with a creamery, and in fixing rates, the management underestimated the cost of conducting the business of its electric central station.

INTERSTATE COMMERCE COMMISSION.

The Commission has issued regulations to govern the destruction of records of telephone, telegraph, cable and wireless companies, effective February 1.

Heats of Vaporization.

Experiments carried out at the University of Leiden in Holland, show the heat of vaporization of hydrogen to be about 109 calories at atmospheric pressure. The value found for oxygen is 50 calories.

LETTER TO THE EDITOR.

Refrigerating Apparatus for Cooling Dynamos.

To the Editor:

In your issue of November 15 an article on "The Use of Refrigerating Apparatus to Aid in Cooling Dynamos on Overload," by Mr. S. F. Walker, contains some statements of the size of refrigerating machines required for stated cases, which are so far from correct that I feel that they should not be passed without correction.

Under the heading "The Sizes of Refrigerating Machines Required" the author figures that with the air cooled from 62 degrees to 32 degrees by refrigeration, 20 tons refrigerating effect will be required to take care of 25 per cent overload on a 1,000-kilowatt generator, and 32 tons for 50 per cent overload.

As correctly stated, with a temperature rise in the cooling air of 80 degrees approximately 7,350 cubic feet of air per minute will be required to carry off 10,700 British thermal units, the total of the generator losses assumed for 25 per cent overload. This volume of air is to be cooled by refrigeration from 62 degrees to 32 degrees. In determining the refrigerating effect necessary to accomplish this, the author states that since this cooling of 30 degrees is three-eighths of the total of 80 degrees which the air will be raised by the generator losses, three-eighths of these losses, or 4,000 thermal units per minute must be taken care of by refrigeration. This would be correct if the air did not contain sufficient moisture to become saturated at a temperature above 32 degrees. At 32 degrees, air contains two grains of water vapor per cubic foot at saturation, or 32 degrees is the dew point corresponding to two grains—the temperature at which precipitation will occur with air containing this amount of water vapor. At 62 degrees it contains 6.1 grains when saturated.

Except in extremely arid regions the air always contains much more than two grains of moisture per cubic foot when at a temperature of 62 degrees. In this locality it seldom contains less than four grains at this temperature and increases to saturation during rain or fog.

Taking the condition of the air as saturated at 62 degrees, the refrigerating capacity required to reduce 7,350 cubic feet per minute to 32 degrees should be calculated as follows:

$$(7{,}350\times30)/55 = 4{,}000$$
$$7{,}350\times4.1\times0.189 = 5{,}696$$
$$4{,}000+5{,}696 = 9{,}696$$
$$9{,}696/197 = 49.2$$

Therefore 49.2 tons is the required capacity of refrigerating machine.

The first amount, 4,000 British thermal units, is the amount of heat which must be abstracted to cool the air only, and is obtained by multiplying the cubic feet of air by the number of degrees it is to be cooled, and dividing by 55, the approximate number of cubic feet of air changed one degree by one heat unit.

The second amount, 5,696 British thermal units, is the amount of heat which must be abstracted to condense the water vapor. As previously stated, saturated air at 32 degrees contains two grains of water vapor per cubic foot, and at 62 degrees, 6.1 grains. When it is cooled to the lower temperature, the excess vapor, 4.1 grains per cubic foot, must be condensed. This will require approximately 1,092 British thermal units per pound, or 0.189 units per grain.

The total of these two amounts divided by 197 gives the total refrigerating capacity required. Similarly the refrigeration required for 50 per cent overload will be 78.5 tons. These amounts are about 2.5 times those given in the article referred to.

The above figures are not exact, but are close approximations. For an exact calculation, allowance must be made for cooling the fixed gases constituting the air, for cooling the water vapor, for condensing the vapor to a liquid, and for cooling the liquid. Account must also be taken of the facts that from the time the dew point is reached, when condensation begins to take place, the amount of water vapor is constantly decreasing, and the amount of liquid increasing, and that the latent heat of vaporization is different for each temperature.

For more ready comparison we have used the temperatures given by the author of the article referred to, but if artificial cooling is to be depended upon it certainly must be calculated to care for a much higher outdoor air temperature. At summer temperatures in this locality it is not unusual for the air to contain as much as nine grains of water vapor per cubic foot, which would increase the refrigeration required to a much larger figure.

In another portion of the article the author refers correctly to methods in use in cold-storage warehouses for producing air temperatures below freezing, but overlooks again the item of the amount of water vapor which is condensed out when cooling a large volume of warm moist air. In cold-storage warehouses the air is recirculated and every precaution taken to reduce the amount of outside air admitted. The fact that the outside air contains moisture which will have to be condensed is actually of more importance than the fact that it is warm and will have to be cooled.

The method of passing air to be used for cooling generators through a water spray for the purpose of removing the dust and cooling the water has been used to a limited extent. When the advantages of this method becomes more widely known we believe its application will become much more general.

The author refers to this method in the first paragraph of his article but his statement that "the temperature of the air will be lowered to that of the water employed" shows a misunderstanding of the method. While it is possible to accomplish approximately this result with a sufficiently large supply of cold water the practical method is based on a different principle.

Briefly, when air is brought into intimate contact with water, as by passing over wet surfaces or through a spray, both the water and the air assume the same temperature—that which would be shown by a wet-bulb thermometer in the entering air. This is independent of the original temperature of the water and remains constant without the supply of fresh water, except in sufficient amount to replace that evaporated. The lowering of the temperature is produced by the evaporation of the water to produce saturation of the air. The temperature reached is dependent upon the temperature and relative humidity of the entering air and will vary as either of these change.

For example, if the entering air is at a temperature of 75 degrees with 44 per cent relative humidity, it will be cooled to the corresponding wet-bulb temperature of 61 degrees by passing through a water spray.

This air possesses three distinct advantages for generator cooling—freedom from dust, lower temperature, and greater capacity for absorbing heat, due to the presence of the maximum quantity of water vapor.

CHARLES A. TRIPP.

Indianapolis, Ind., January 29, 1914.

Jovian Rejuvenation in Kentucky.

James Clark, Jr., president of the James Clark, Jr., Electric Company, who is statesman for the Jovian Order in Kentucky, is planning a rejuvenation, to be held in the near future. It is expected that the affair will mark an era in organization work among the electrical interests of the state. It was intended to hold a rejuvenation in January, but an accident suffered by Mr. Clark prevented him from carrying out his plans. He has fully recovered, and is preparing to carry out the original idea. The rejuvenation will be held in Louisville.

COST SYSTEMS IN SMALL FACTORIES.

By P. S. Paganini.

In the devising, installing and operating of cost systems in small factories two important factors have in my opinion and from my experience, been slighted. I refer to the cost of operation and to what I would call the elasticity of the system; meaning thereby the ability of the cost department to take care of a sudden change in value in one of the elements of the cost of production without a complete change of the cost schedules and the possibility of furnishing accurate information of costs during the process of manufacturing and before completing the cycle of production; viz: the sale of the product.

The cost of operation is important, as in a small concern with low overhead expenses and low margin of profits, high cost means lowering of the net profit, and only the cost of operation is considered, as this is undoubtedly to be charged to the overhead expense account, while the cost of devising and installing the system could properly be charged to capital account.

Elasticity is important, for while the ideal cost system is the one that in furnishing a complete tabulation of costs, gives all the information required for an efficient study, its real and fundamental value consists in giving the correct cost for the determination of the sale price. This sale price cannot be determined unless the costs are known before the sale takes place and the cost of manufacturing must be controlled during all stages so as to produce at an actual cost less than a practical selling price, as established by demand and competition.

The two factors are somewhat related, as in many cases the operating cost is kept down by overloading the cost department with work, so as to destroy any possibility of quick operation, or by allowing the cost department to lag so with final results that its only usefulness is as a guide for future work. There is originated in the sales department a tendency to take chances on prices, a policy which may in the main be successful but it has too many of the qualities of the game of hazard to be satisfactory.

Among the most noticable defects of many systems now in operation, defects that tend to defeat the purposes of quickness and low cost, the following may be considered: Multiplicity of reports and forms and their overlapping and interlacing; the requiring of technical and theoretical information from people unable to furnish them by intellectual and educational limitations; the inaccurate and misleading distribution of labor changes; the assuming for working purposes of impossible relations between the different elements of the cost production.

It will serve better the purpose of this article if we analyze more minutely some of these defects, and furnish some examples from cost systems known to the author before attempting to indicate remedies.

One of the most common forms of cost systems requires the individual workman to fill in for every particular job a time form giving "name", "clock number," "machine-class-type" on which the job is done, "time of starting," "time of completion," "piece-work rate" if any, "hourly rate of wages." Those forms, in duplicate or triplicate, are collected and collated by the department clerk on a special time sheet. These with the original order for the job and a material sheet, are sent to the cost department for checking and figuring. The average workman being generally careless in regard to figures, a number of mistakes are made, especially in the filling in of the "machine-class" question; this at the best being a series of meaningless letters, very hard to memorize and hard to copy in a small place. If the department clerk does not catch the error the cost department must either send the report back, as no corrections are supposed to be made by the cost department clerks, or either send for the department clerk for consultation. The time lost is always very considerable, and the department clerk's temper is always on the ragged edge, not a very good condition for efficiency.

In another factory, where the output consists of a very special line of goods, made up in a general way of a soft inner center, coated with a widely different quantity, for different grades of goods of a slightly harder and costly material, and in which the cost of the coating has a very large influence on the final cost of the product and its handling requires a considerable amount of labor, material records and time records are kept by different persons for the same job. Moreover, there is kept by the different departments through which the goods pass in their completing stages a series of material sheets and time sheets. Comparison of those sheets generally disclose discrepancies both in regard to time and in regard to material, and the location of the error is more a matter of guess work than one of certainty and it is quite impossible to fix any responsibility. The foreman of the department where the coating is done, and who, swamped with work, is asked

to do the figuring of all the percentage and averages which the determination of total cost naturally involves. He submits to the cost clerk the results of these calculations but not the data from which they are obtained. Apart from the main fact that the cost clerk would be more fitted to do this kind of work there is no way for him to check the foreman, so that he can guarantee the authenticity of the figures and feel that the reports he derived from them have any basis in facts.

In another case, where the hands belong to a very low class of labor—so poor that most of them are illiterate—the foreman is held responsible for the labor charge and distribution. What greater temptation for him than to overload with labor charged and increase the cost of that kind of work which is distasteful to him. It clogs his department and lowers the total amount of its output; it cannot be well done on account of the low mechanical ability of his help.

A last example of violation of the elementary laws of cost accounting is a large corporation made up of small factory units which determine its cost elements to be three—labor, material and manufacturing expenses. The last item includes rent, light, power, water, taxes, insurance, repairs, salaries, etc. Its cost instructions say "We have found after long experience that our labor amount is the one that varies less than any other," and "that our manufacturing expenses are a fixed percentage of this labor total;" consequently any time their cost schedules show a labor item, a certain fixed percentage is introduced into the formula to cover their overhead expenses. This would be an easy way out, if there was any truth in the theory, but there is not. While it is true to a certain extent that their total yearly wages do not vary much, the amount in pounds, and the quality as to telling prices and net profit of their output varied widely from year to year. That means that the cost per pound is consequently different, and that the percentage of rent, light, power, etc., which must bear on every pound of output, must be different. As a matter of fact, these percentages are changed from year to year, and do duty for the next year, when conditions may be so altogether different from the conditions originally, that all of the cost figures will not correspond, and by a wide margin be altogether unreliable and misleading.

The installation of a practical cost system in a small concern is quite easy, if patience, common sense and average intelligence are brought to bear on the task. It is not reasonable to introduce a set of multicolored forms and call them a system, and it cannot either be pretended that a system will be in working order and give results from the day of its inception. Fundamentally factors for the particular case in hand must be carefully found out, tried and established in clear form. The study of greater efficiency had better be left alone in the beginning. As a matter of fact, efficiency can be better obtained in small concerns by the individual and collective efforts of superintendent, and foreman, who know conditions and workmen, than by the sporadic, violent labors of a cost accountant, projected into the works for a period of time, which must at best be short, and crowded with difficulties of different kinds.

After a thorough study of the practice of manufacturing in the particular factory, I would suggest that as clearly as it is possible all the separate elements of cost be defined and divided into two classifications—those that change and those that do not. Work the cost system so as to have continuous reports made daily of those factors that do change, or, to state it better, limit continuous checking of costs to those elements which by mutual reasons present a large percentage of variations, and limit the check on the others to stated periods only. Cost figures are not and never will be fit to put on a balance sheet, and by eliminating some work, one will be better able to take care and keep up with the really important items. It is better to control all the time part of the elements of cost than not to control any at all.

To do so split, the cost schedules in such a way that from the reports it may constantly be determined if too much material or labor is being used for a certain job. These two items are generally the important, widely changing elements. It will be possible to do so, if in the beginning all the other elements, such as power, water, light, have been by patient work standardized for whatever unit of production—pound, machine, inch, you choose for your own. If the system is to be made as useful as is possible it must be made so that it can control costs where costs are made; viz: in the production departments. It must not follow the fallacy that cost is practically the keeping of time, but the truism that cost is the controlling of time. To do so the ever human factor must be taken into consideration. In small concerns the department foreman is a much more important unit of production than in large factories. His responsibilities may be smaller in money and in men but his personality looms larger. Most of the time he is a working foreman and the best workman in the department, and his time and work are important factors in the total cost of its output. If the cost department requires him to use too much of his time to fill in reports the usefulness of which he does not see, or refuses to see, his value from a cost point of view is lessened. He will undoubtedly guess at figures and turn in a lot of trash, and his men will follow his example. If, instead, he is made to understand that the function of the cost department is not to catch his errors and show him up with the powers that be, but to help him out in avoiding errors and preposterous costs he will be the mainstay of the cost clerk. A plan which I found workable is to furnish the foremen with a list of all the operations of their departments. This list, besides the quality of material which it is permissible to use for each and every operation, contains the number and hourly wages and maximum time of the man and it can be used to keep the cost below or at par with the standard cost of production as given by the cost schedule. I obtained with this the control of cost at the origin and decreased my work very considerably, while at the same time I gave the foreman a chance to stand on his legs intellectually.

Consolidation in Paris.

The Compagnie Parisienne de Distribution d'Électricité of Paris, France, has absorbed the six electrical central-station companies previously operating in the different districts of the city. The company which is effecting the consolidation is a syndicate of the existing companies. The merger was sanctioned by the municipal council and the new company will have a concession lasting until 1940. There will be a committee of control representing the municipal and public interests.

Paris will be divided up into three sections; western, central and eastern. The central district will be supplied with low-pressure direct current; the eastern district with two-phase alternating current, and the western district with single-phase alternating current. The new company will have a monopoly in electric lighting, but not in power. The municipality reserves the option of providing for future demands by taking on bulk supply from any hydroelectric plant, and consideration has already been given to the transmission of power from a station on the Rhone River.

Half-Watt Lamps in England.

Lamp manufacturers in England are now offering half-watt tungsten lamps commercially in sizes from 600 to 3,000 candlepower, for voltages from 50 to 250. A life of 800 hours is guaranteed by the manufacturers. Prices range from $7.30 to $14.60.

Western Association of Electrical Inspectors.

Ninth Annual Convention, Cincinnati, O., January 27-29.

The most successful convention as yet held by the Western Association of Electrical Inspectors was the ninth annual meeting held on Tuesday, Wednesday and Thursday of last week at the new Hotel Gibson, Cincinnati, O. Considerably over 100 members and others interested in inspection work attended the convention. Close attention was given to the meetings, which brought out interesting discussions of the many inspection problems. The committees showed improved activity by most of their reports. The local convention committees, under the direction of William B. Hubbell, of Cincinnati, made every effort to promote the success of the convention and the welfare of the members. Another feature making for a fine meeting was the excellent spring weather enjoyed during midwinter.

The first session was opened at 11 a. m., on Tuesday by President Ben W. Clark, of Detroit. He introduced Mayor Frederick S. Spiegel, of Cincinnati, who delivered a very cordial address of welcome. He called attention to many features of interest in the city, referring particularly to the University of Cincinnati, which is the only municipal institution of the kind on this continent; he also asked the members to visit the new waterworks of the city, which has recently been built at considerable cost and has decidedly promoted the health and safety of the community. He lauded the work of electrical inspectors and referred to a case which had been brought before him while he was judge, in which defective wiring in a merchant's window, done by nonelectrical men, had resulted in serious injuries and a verdict of $10,000 against the merchant. This convinced him that electrical work must be done properly and by competent persons.

H. B. Long, of Nashville, Tenn., made an eloquent reply to the Mayor's address on behalf of the Association. He called attention to the aim of electrical inspection and its growing importance with the development in all the electrical industries. The Association is composed of municipal electrical inspectors and inspectors of insurance organizations and of other electrical interests. A study is made of all electrical hazards and how they can be minimized.

Following the roll call, President Clark delivered a brief presidential address. He said that the Association had held a most important place in electrical affairs. It has members in a majority of our states and also several in Canada. One of its aims is to promote consistent rulings through the country. The National Electrical Code forms a high standard of electrical construction but it needs revision from time to time in order to keep it abreast of the changes constantly occurring in conditions, and also of the development of new electrical apparatus. He urged the Association to take a more active part in the consideration of proposed amendments to the Code. Another matter that it is important to study and discuss is the improved management of inspection departments, particularly those of municipalities.

The report of the Executive Committee was read by W. S. Boyd, of Chicago, and briefly reviewed the various meetings and activities of this committee. Mr. Boyd then presented his report as secretary. During the year 15 new members had been elected. The membership at the time of the convention was 175 members. He was glad to report that committee work had been greatly improved and nearly all of the committees were active and deeply engrossed in their work. Many problems are not settled by reference to the National Electrical Code, especially such problems as arise in small communities where there is apt to be a scarcity of references that may be consulted on all kinds of electrical matters; therefore Mr. Boyd suggested that a small circulating library be provided by the Association to be loaned to members from time to time as an aid in working out various electrical problems.

On motion of Mr. Boyd it was decided to create a committee of five to consider a general revision of the articles of association and by-laws, so as to bring some features of the Association's organic law more abreast of present conditions. Through a motion by Mr. Boyd it was also decided to create a committee of three to consider the purchase of a small circulating reference library such as he had advocated in his report.

The question of the meeting place for the next annual meeting was brought up by F. G. Dustin, who cordially invited the Association to assemble at Minneapolis next year. R. J. Swain invited the convention to St. Boniface, Man., Canada. Other invitations were received to hold the next meeting on the Pacific Coast at San Francisco or Seattle. An invitation was also received from Indianapolis and one from Chicago. After some discussion, in which James Bennett, V. H. Tousley, F. H. Spears, F. G. Dustin, W. S. Boyd and others participated, it was decided to refer the matter to the Executive Committee to take its usual action thereon. Before the close of the session, President Clark appointed James Bennett, F. L. Lucas and F. G. Waldenfels as a Nominating Committee.

On reassembling in the afternoon there was announced the appointment of a committee to consider constitutional revision; this consists of V. H. Tousley, F. D. Varnam, H. M. Maxwell, H. B. Long and Ben W. Clark. The committee to consider the question of circulating library was appointed to consist of W. S. Boyd, F. R. Daniel and F. H. Moore. Secretary Boyd read letters of regret at their inability to be present at the convention from James E. Pole and Waldemar Michaelson.

A report of the Committee on National Electrical Code was presented by F. D. Varnam, chairman. It was very brief, since the Committee had received no suggestions from members as to further revisions. This was probably due to the fact that the recent edition of the Code has not been in the hands of the members long enough. He urged that future committees on this and similar topics be announced somewhat earlier in order that they may have more time for action. W. S. Boyd then presented his audited report as treasurer, which was accepted.

H. E. Bloomer, Milwaukee, Wis., introduced the subject of approving refillable fuses, which aroused a spirited discussion; participating in this were James Bennett, R. L. Daniel, R. J. Swain, B. H. Glover, V. H. Tousley, F. D. Varnam, H. B. Long, W. S. Boyd, F. R. Daniel and others. After a rather involved parliamentary tangle the matter was deferred until the Wednesday afternoon session.

Outside Wiring.

The Committee on Outside Wiring, of which M. E. Cheney, Chicago, was chairman, presented a report that was read by Guy W. See, Minneapolis. The best outside construction has been found to pay, not only because of decreased maintenance of the overhead lines, but because it insures continuity of service and reduces the liability of accidents to linemen and the public. Therefore the Committee urged more rigid rules on this matter, so as to reduce the hazards. One western state now has a specific law on the subject to minimize the life hazard. The Committee report brought up two main topics, of which the first was the question of whether 2,300-volt lines should have bare or insulated wire. The

contention is frequently made that the insulation on such lines gives a false sense of security, and since it is of doubtful value it might as well be discarded entirely. The Committee thought, however, that although weatherproof insulation on such lines is often taken for more than it is worth and has a much shorter useful life than that of the copper conductor, nevertheless the Committee is convinced that weatherproof insulation on such lines offers considerable protection from crosses between the lines and the wires of signaling or other low-potential circuits that may come in contact therewith. Therefore, the Committee deems it unwise to recommend bare wire; in fact, it distinctly urges the use of insulated wire in all overhead construction from 50 to 2,300 volts.

The other question considered in the report is whether guy lines should be insulated, grounded or both. This must be considered from the standpoint of protection both of the linemen and of the public. The lineman must be thoroughly insulated from the ground, therefore, there must be no grounded lines or guys within his reach. The Committee recommended the rule of the National Electric Light Association Committee on Overhead Construction, that all guys for light and power poles be insulated by two strain insulators, the upper one being inserted in the guy so as to be at least six feet in a horizontal direction from the pole, or at least six feet below the lowest live wire; the second strain insulator to be inserted so as to be between six and eight feet from the lower end of the guy and at least eight feet from the ground. In short guys where the two insulators would be brought close together, they may be coupled in series. As to anchor guys and low guys, the Committee recommended that the former should run directly from pole to an anchor imbedded in the ground, or which is otherwise in contact with the ground, in addition to the strain insulators mentioned above. The grounded end of the anchor guy shall be permanently and effectively grounded, provided such guy be near the curb on a street with car tracks or in immediate vicinity of water or gas mains, hydrants or other grounded conducting structures. If not so located, then it must be surrounded by wooden boxing or other approved insulating protection from the ground to reach to a vertical height of at least eight feet. If the guy is secured to a stub wood pole so that any part of the guy is less than eight feet from the ground, or if it is guyed to a metal pole, then in addition to the strain insulators required the guy shall be permanently and effectively grounded. Where no such grounded structures exist and but little opportunity is given for a regional ground to result in injury, the wooden or similar boxing is considered ample.

Strain insulators provided for in the Committee's recommendations must be of material resisting the action of weather and have a strength at least twice the strength of the guy in which they are inserted. They shall preferably be constructed so as to have their metallic parts interlock. They must stand a flashover test four times the highest voltage of the line on which used and under a precipitation of water of one-fifth inch per minute at an inclination of 45 degrees to the axis of the insulators.

Edward J. McGann, Chicago, then presented a paper in which he gave the results of a series of tests made in the municipal electrical laboratory in Chicago on a number of samples of weatherproof insulated wire for 2,300-volt lines. Both dry and severe wet tests were made on new wire and on wire that had been in service continually for three, five and ten years. The object was to determine the value of such insulation after various periods of use. Some of the older samples were not up to present standards for thickness of weatherproof insulation. The new wire, of course, showed the best results, in the dry test withstanding about four times line voltage to ground; on the wet test the dielectric strength was greatly reduced. As the age of the sample increased the value of its insulation diminished. Nevertheless, where the sample was intact, that is, without bare spots where the insulation had rotted or worn off, even the ten-year wet sample showed that it had some value in preventing short-circuits from swinging contact of wires of opposed polarity. In no cases except with new wire can weatherproof insulation be relied upon to safeguard linemen on poles; they should in all cases use good rubber gloves, therefore, when working on 2,300-volt lines. The weatherproof insulation does serve, however, to prevent the trouble from line crosses, which would be quite frequent and serious were bare wires used; it thus promotes continuity of service. It also serves to prolong the life of copper wires in smoky places, such as adjoining railroads. Moreover, it reduces the fire hazard and diminishes the danger of accidental contact with dry wires.

The committee's report and Mr. McGann's paper were discussed together. W. J. Canada, Washington, D. C., said that the committee should consider how to improve weatherproof insulation for such lines. He thought it important to secure better insulation not only to protect the linemen but also to insure greater continuity of service. In the tests reported on by Mr. McGann he did not think that the second and third braid increased the life of the insulation more than 10 to 15 per cent. It is the inner layer of insulation that is the vital part of the entire insulated covering. Among others who discussed the matter briefly were W. S. Boyd and Guy W. See.

The report of the Committee on Show-Window and Display Lighting, F. P. McGough, chairman, was read by Secretary Boyd. This report is given practically in full in another part of this issue.

F. H. Spears, Springfield, Ill., cited a number of cases in which clerks or window trimmers had pinned display matter to exposed lamp cord and caused short-circuits, in one case resulting in a serious fire. F. G. Waldenfels, Chicago, said he had found some trouble from defective insulation of armored lamp cord in show windows. K. W. Adkins said that there is no excuse for improper installation of armored cord and that it is the best thing that can be used where rigid conduit is not suitable.

Incandescent Lamp and Its Circuit.

On Wednesday morning the session opened with the presentation by R. W. Shenton, of a paper entitled "The Incandescent Lamp and Its Circuit." Mr. Shenton referred to the extraordinary increases in the efficiency of incandescent lamps during the 30 odd years of their development. Beginning with a consumption of about seven watts per candlepower in the early eighties, this has now been reduced in the latest high-efficiency lamps to about one-half watt per candlepower. Throughout this extraordinary development the fundamental principle of the lamp construction has not been radically modified and progress has been achieved through steady improvements in manufacture and more intensive use. Mr. Shenton referred to recent improvements in filament lamps, such as the much greater strength of the tungsten filaments, the concentrated or helical filaments, the reduction of blackening in the bulb due to the use of vacuum-improving chemicals. These latter features were essential steps in order to bring about the development of the so-called half-watt tungsten lamp. The reduction of blackening of the bulb by the use of chemicals has alone improved the average efficiency of the lamp during life by about 15 per cent.

The new half-watt lamp is often improperly called the nitrogen lamp, though other gases can and have been used for filling the bulb. Mr. Shenton explained the construction of this type of lamp and showed one of 750-watt and 1,000-candlepower rating. He described its characteristics and its particular field of service.

Taking up the lamp circuit he called attention to the old limitation of 12 lamps for a 660-watt circuit as

not being suitable for modern tungsten lamps and hoped to see a more flexible rule adopted. In all interior lighting circuits it is important to lay out and install the wiring so as to keep down the voltage drop between the service entrance and the actual lamp sockets. In those installations where long circuits are run there is a considerable drop in voltage which results in decided decrease in the candlepower and efficiency of the lamps that are run below their rated voltage. To run a 110-volt tungsten lamp at 2.5 volts below its rated voltage causes a drop in the efficiency of about nine per cent.

The discussion of this paper consisted chiefly of questions asked Mr. Shenton. As to whether the new nitrogen lamps diminish the danger of igniting gasoline if such lamps were broken in a garage, he replied that there probably was no effect one way or the other. As to whether the standard dimensions of the base and skirt of the lamps have been changed, F. A. Barron replied that the General Electric Company had adhered very rigidly to the standard dimensions for not only candelabra and medium but also mogul size lamps. Other questions brought out that the temperature of the glass bulb of the so-called nitrogen lamps is much hotter than that of the ordinary tungsten lamp. The heat of the latter does not increase with age to nearly so great an extent as does that of the carbon lamps. The heating in the latter was due to the exceptional amount of blackening which caused absorption of energy in its passage through the glass. In but very few cases are shock absorbers necessary. Some tests made with drawn-wire tungsten filaments indicated that the tungsten wire is stronger than the glass bulb.

Electric Traction Wiring.

The report of the Committee on Electric Traction Systems was presented by Frank Daniels, Chicago, chairman. The report of the Committee was confined entirely to the subject of car wiring. The existing regulations in Rule 40 of the Code cover 600-volt direct-current systems. There is an increasing number of traction systems using voltages within the cars above this point and even to as high as 7,200 volts. In order to make the existing rules cover these higher voltages and also cover the use of improved devices, the Committee submitted a draft of regulations deemed satisfactory to meet the existing conditions. The suggestions were drawn up as 15 sections to a completely revised rule No. 40, the titles of these being as follows: *a*—wires and cables; *b*—cabinets; *c*—cutouts and switches; *d*—circuit breakers and oil switches; *e*—conduit; *f*—molding; *g*—under car-body protection; *h*—power wiring; *i*—lightning arresters; *j*—air-pump motors; *k*—lighting circuits and fixtures; *l*—headlights; *m*—electric heaters; *n*—storage batteries; *o*—miscellaneous rules. Each of these sections were subdivided, in the case of power wiring to 11 distinct subclasses, some of which were further subdivided.

As the different rules were presented there was discussion of them. Among the points discussed were the various percentages of full-load current to be used in determining the size of motor, control, transformer and resistance leads, the rule requiring that cabinets shall have doors closing by gravity, the use of molding in cars, the specification of metal inclosures to be over 0.04-inch thick, the limiting of lighting circuits to 1,500 watts, etc. The Committee was continued and the report referred back to it for further consideration.

C. H. Anderson, of the Cincinnati Car Company, gave a short talk entitled "Practical Car Wiring." He traced the development of street-car construction from the very light and small horse cars to the somewhat larger cable cars and subsequently to the various stages of electric-car construction. The use of electric motors has permitted a very great increase in the size and power of the cars. The early builders of street cars were not adapted to building large cars, however, and many of the latter have been poorly designed. The increase in the length of haul in city service has reduced the profit and the very heavy construction of the long cars has necessitated carrying around a lot of dead weight, which has still further reduced the profit. Mr. Anderson said that it costs about $50 a year to haul 1,000 pounds of dead weight in a car; consequently in the last few years there has been a change toward building cars of lighter weight. Effort has also been made to bring the car floor nearer to the street surface, so as to make the car easier of ingress and egress; this is being accomplished by using smaller wheels. A difficulty is introduced at this point, however, because in order to provide for the elaborate wiring used for the motors and control gear there is scarcely enough room under the car for the conduit system and the various mechanical and electrical auxiliaries that must be installed. In order to reduce the dead weight it is becoming the practice to make every part of the car become not only an essential part of its strength but also, if feasible, to serve a dual purpose. Steel construction has permitted this to a large extent. Mr. Anderson suggested a type of floor construction of reinforced concrete or similar material in which channels would be provided on the underside of the floor for running the wires without having so much space and weight taken up by a separate layer of conduits. At the present time practically only steel cars are being built. The rules for wiring of street cars should be made elastic enough to meet these conditions.

Theater Wiring.

The report of the Committee on Theater Wiring was presented by F. L. Lucas, Toledo, O., chairman. The report recommended an addition to Rule 38*b*, requiring that all motors used in the theater be of inclosed type or inclosed in a fireproof compartment of standard construction to be used for this purpose only. The limitation on fuses should be changed from six to ten amperes. Advance notices should be given to traveling-show companies to have their electrical equipment up to certain standard conditions. Mr. Lucas pointed out that in Toledo it has been the custom to send out these notices a week or so in advance, the company being required to state what portable electrical equipment it wishes to use and at the same time being informed of the requirements for such equipment. When the company arrives it is usually found that the equipment has been put in pretty fair condition which simplifies its inspection before use.

There was a general discussion of this report in which James Bennett, W. J. Canada, B. H. Glover, F. H. Spears and others participated. Mr. Spears said that he has had no difficulty in Springfield, Ill., with theaters because jointly with the building department it has been arranged to have an inspection of all theaters at least once a week and all electrical equipment must be put in perfect order before being used. Mr. Bennett called attention to the fact that magazines are frequently not used for rewinding moving-picture films. The report of the committee was accepted but the feature dealing with the requirements for motors was referred back for further consideration.

Electric Inspection Problems.

A general discussion followed of various problems coming up in electrical inspection. R. L. Daniel, Minneapolis, Minn., asked as to the experience of inspectors with the approved types of motor-driven moving-picture machines. F. L. Lucas cited a case in which fire had resulted from failure of a safety device in such a motor-driven machine while the operator was absent. Mr. Daniel also referred to a case of fire resulting from an older type of machine. James Bennett said that the standard approved machines have been found very satisfactory; they have been subjected to the most severe tests and the safety devices found reliable. A. G. Sturdevant said that in Cincinnati the motor-driven machine is approved if it has an automatic release switch which opens the motor circuit if the operator releases his hand therefrom; this solves

the difficulty from the operator leaving the machine. This additional requirement was caused by a fire where it had been shown conclusively that the operator had left the machine contrary to rules. V. H. Tousley urged that the lamp house be made of such size as to limit the temperature of the casing to 270 degrees on any exposed part; this would prevent the liability of any broken end of the film from igniting if it should come in contact with the lamp house, since this temperature is safe. F. D. Varnam and Ben W. Clark strongly advocated the approved motor-driven machine, which they have found safer than the old hand-operated machine. F. H. Spears said there is practically no trouble from the machines but much more trouble is due directly to careless or negligent operators. The weekly inspection made of moving-picture theaters in Springfield, Ill., has impressed on operators strict attention to duty, if they do not wish revocation of their licenses. O. M. Frykman, Minneapolis, said he had found that in small towns, because of the lack of inspection, operators tended to remove the safety fixtures of moving-picture machines. Among others who discussed the subject were R. J. Swain and Mr. Lucas.

James Bennett, Montreal, Canada, brought up the question of proper grounding of transformer secondaries. A proposal had been put up to him for approval of grounding by a galvanized-iron pipe of one-inch diameter and nine feet long driven into the ground. He had declared that this was not satisfactory because in the city in question (Quebec) the soil was too dry to make this an effective ground. Subsequently he had made a series of tests with such a type of ground and found that in the higher parts of the city its value was practically nil, but that its effectiveness as a ground improved as the lower levels were reached and that at the old river level it seemed to be perfectly reliable because the ground was permanently wet. Therefore, it must be remembered that the method of grounding referred to might be suitable in special conditions; but at any rate the method of grounding should be specified for the type of soil involved. F. D. Varnam cited a case of a pipe ground that was driven 12 feet deep that was entirely unsatisfactory; a man had been seriously shocked by coming in contact therewith and it was found that a difference of 2,000 volts existed between the pipe ground and a point only three feet therefrom. W. J. Canada said that what is required in grounding is not only a low-resistance ground but more particularly to have the voltage difference between the grounded structure and any adjacent point within a safe limit. He thought it was better to use a number of grounds instead of depending upon one only and to limit the voltage difference between grounded structures and grounds to 50 volts. B. W. Clark said that multiple pipe grounds had proved entirely satisfactory in Detroit and V. H. Tousley stated that pipe grounds have also been found satisfactory in Chicago.

W. E. Flickinger, Detroit, asked as to the requirements in Rule 59*e* about fastening loom in outlet boxes. A number of speakers said they had found a certain type of these devices now on the market including both clamps and bushings to be very satisfactory. Others thought that more specific requirements should be laid down in the Code. This matter was finally referred to the Code Committee with a suggestion that Rule 26*u* be added to by specifying installation rules on this point.

F. L. Lucas asked about the requirement in Rule 38 for an emergency service switch in theaters, and there was some discussion of this point, but it was deferred until the following day.

Refillable Fuses.

The subject of refillable fuses was again brought up from the preceding day's discussion, by Victor H. Tousley, Chicago, who moved that the Association recommend that Rule 68*d* be so revised as to permit the approval of refillable cartridge fuses. This motion was carried unanimously. Before this matter was dropped, however, H. E. Bloomer Milwaukee, Wis., asked as to the experience with refillable fuses. A number of speakers said that one type of these had proven very satisfactory; that these fuses had stood up under severe tests and seemed to meet all requirements. B. H. Glover said the Underwriters' Laboratories have not recommended any refillable fuse because Code requirements do not permit such approval. A certain type of refillable fuse had met all the requirements of rating and performance but could not be given formal approval on account of the restriction just mentioned. F. A. Barron said he regretted to see the Association apparently take a stand which meant really a lowering of standards in fuse requirements. There is no doubt abuse of standard cartridge fuses on account of the fallibility of the human element, but he doubted the wisdom of the proposal to approve any type of refillable fuse.

A. L. Eustice, Chicago, replied to Mr. Barron by pointing out that the best opinion in the inspection field seems to welcome a reliable form of renewable cartridge fuse as a solution of the vexatious fuse problem. He felt that the opposition to the use of renewable fuses was based entirely upon theoretical grounds; experience in the field with various types of renewable fuses has shown that renewable fuses can be built that will meet the performance requirements and solve the old difficulties of improper fusing. It has been conclusively shown that a proper type of renewable fuse can be and is being properly renewed and is therefore suitable for certain cases where there is evident need for a fuse of this type. In industrial plants, where unavoidable conditions cause frequent blowing of fuses, it is necessary that renewals of the fuse be made at moderate cost. If this is not done an improper fuse element will be inserted. A fuse is used for the very purpose of safeguarding the circuit and apparatus to which it is connected and it should blow when an abnormal load or other condition exists. Records of jobbers show that repeat orders for standard non-renewable fuses are not received to any extent after the first order, showing that the fuses are not being replaced by new units but are refilled on the premises, evidently in an improper manner in altogether too many cases. A properly constructed renewable fuse permits easy inspection of the fuse element and this insures that it is being properly refused. The denial of renewal results only in the temptation to improperly defeat the object of a fuse.

The question of service switch blades was brought up by Mr. Johnson, who said that he had been told by some contractors that it is impossible to make such switch blades dead according to the rule. V. H. Tousley and J. Bennett showed that the rule can be easily carried out in the case of service switches. B. H. Glover stated that switches are made by all manufacturers so as to have the fuses either at the hinge or at the clip end, and both these types are approved. Whether the one or the other type shall be used depends on local conditions. There really is some objection to both types and actual conditions must determine which shall be used. Several speakers approved the requirement of making switch blades dead apply only to service switches. On motion of J. Bennett this matter was referred to the Code Committee.

Defective Appliances

V. H. Tousley, Chicago, called attention to the sale of defective electrical appliances which has caused some difficulty in Chicago and other large cities. Many of these, such as improperly constructed flatirons, projecting lanterns or other devices with defective and cheap attachments, have been found on sale in department stores; the electrical features of such devices have frequently been found very unsatisfactory and of such character as to result both in life and fire hazard. An attempt is being made in Illinois to secure legislation empowering municipal inspectors to condemn such appliances. James H. Fenton, St. Louis, stated it was a very difficult problem because, if such devices are debarred in some places, they are likely

to be shipped to other places. This has been found to apply not only to the appliances Mr. Tousley had mentioned but also to sockets and other wiring devices. Others who discussed the matter were Messrs. Bennett, Barron and Hunt. The latter stated that manufacturers of this cheap and defective class of goods claimed that they cannot use approved attachment plugs, wire, etc., because of supposed prohibitive price and efforts to sell approved supplies to such makers have frequently been unsuccessful. One speaker thought that this matter could be solved by having frequent reinspection of all electrical installations. The various fire-prevention associations should be urged to take up active propaganda to educate the public against improper electrical apparatus. He therefore suggested that fire-prevention bureaus be asked to take up in their bulletins efforts to reduce the hazard from such electrical equipment.

Installation of Induction Motors.

On Thursday morning the session opened with the presentation of the report of the Committee on Installation and Operation of Induction Motors, K. W. Adkins, chairman. This report dealt chiefly with the size of wire to be used for induction-motor circuits. Eight tables were given for recommended sizes of rubber-covered and other insulated wires for single-phase 110 and 220-volt motors, two-phase four-wire 110, 220 and 440-volt motors, and three-phase 110, 220 and 440-volt motors of various horsepower ratings; the full-load current and appropriate size of starting fuse were given for each size of motor. The tables were based on starting with 100 per cent load and on the assumption that starting devices be used for all motors larger than five horsepower. It was recommended that running fuses be provided on all motors of one horsepower and over.

V. H. Tousley, Chicago, criticised the tables as requiring excessive sizes of wire, particularly for large motors. He recommended wiring for an overload of 50 per cent, except in special cases. To use two sets of fuses (starting and running) is seldom necessary. J. E. Latta, Chicago, said he had noticed that inspectors usually require excessive sizes of induction motor leads.

F. A. Barron declared that the starting fuse should protect both the motor and line, while the running fuse is to protect the motor only. There are many classes of motors that do not correspond to the conditions assumed in the tables. A high-speed motor has a higher starting current than a low-speed motor of the same horsepower rating. Therefore, wiring tables for induction motors would have to be extremely numerous to provide for all the varied conditions of service. A series of tests of induction motors was made by the General Electric Company to ascertain starting currents; these indicate that under the worst conditions the starting fuses should provide for 150 per cent of full-load current in motors up to 15 horsepower, 100 per cent of full-load current in motors from 15 to 75 horsepower, and about 75 per cent in motors larger than 75 horsepower.

W. S. Boyd said he formerly was of the opinion that running fuses were not required, but several cases of fires due to their absence convinced him of their importance and he now insists on their use. Mr. Barron stated that when compensators are employed which are provided with no-load and overload release devices that absolutely disconnect the motor from the circuit then running fuses are superfluous.

Mr. Adkins, on behalf of the committee, protested against increasing the number of tables as tending to confusion. The rules for motor wiring should be made as simple as possible to meet the most prevailing conditions. Further discussion of the matter was continued by R. L. Daniel, V. H. Tousley, J. E. Latta and others and on motion the committee was continued and the subject referred back to it. The Code Committee was advised to consider regulations on the protection of induction motors while running.

Architects' Wiring Specifications.

The report of the Committee on Architects' Specifications, presented by F. H. Moore, chairman, dealt largely with the need of co-operation between electrical inspectors and architects and suggested means for furthering this end. A draft of 49 topics to be included in architects' specifications for electrical installation was submitted. Brief comment was made on many of these topics in the report. The general discussion which ensued was devoted to what should and what should not be included in such specifications. It was agreed that the actual size of the wire to be used should seldom be specified, except where the architect's engineer has laid out and calculated all of the details of the entire wiring system.

Rubber-Covered Wire.

At the last session of the convention, Thursday afternoon, V. H. Tousley, chairman of the Committee on Rubber-Covered Wire, presented a report dealing with the status of the old and new Code wire. The weakest link in our electrical wiring system, so far as materials and devices are concerned, has been the rubber-covered wire. There is no part of the country where new Code wire is not now required. Notwithstanding this, however, considerable old Code or substandard wire is to be found here and there. The report points out how some of this wire is surreptitiously thrown on the market and urges labeling of all standard wire or the withdrawal of approval from any manufacturer who is known to manufacture substandard wire. This important report will be published practically in full in a subsequent issue.

J. E. Latta, of the Underwriters' Laboratories, discussed the report at length. He said that in comparison with total output of copper wire the amount of old Code material that is being marketed is relatively small. In the towns and cities which do not have adequate inspection, however, the old Code product is still being rather extensively used. This condition is to be deplored. He explained the limitation of authority of the Laboratories in preventing the sale or use of substandard wire, since their function is to test samples and approve those found to be standard; however, there is no organization more anxious to see the old material discarded. He then explained the factory inspection service and showed that 100 per cent inspection, that is, of every coil made, is impracticable on account of the increase in the cost of the wire thereby involved. If substandard wire is found labeled as approved, a sample thereof should be sent for thorough test, a report of which will be returned promptly free of charge. Special tags are furnished to inspectors for sending in such samples. The simplest test for quickly detecting a doubtful rubber insulation, and which test is quite reliable, is the stretch test on the rubber of the insulation. Wire which shows up properly on this test might fail to meet some of the other new Code specifications, but one will hardly find any piece of old Code wire that would meet the stretch test. In closing, Mr. Latta offered the co-operation of the Laboratories to the Association and to the individual inspectors in weeding out defective wire.

F. A. Barron explained the check system used by the General Electric Company in very successfully verifying the quality of the product. B. H. Glover, of the Underwriters' Laboratories, corroborated Mr. Latta on the present lack of power to compel only new Code wire to be manufactured.

The report of the committee was accepted and on Mr. Tousley's motion the Underwriters' Laboratories were advised to withdraw after June 1, 1914, the label service from any manufacturer who is known to still make old Code rubber-covered wire.

A very brief report of the Committee on Signaling Systems was submitted by Frank S. Anderson, chairman. The chief point raised was on the advisability of grounding the boxes of fire and police alarm systems. J. H. Fenton, St. Louis, said it is imperative to ground the boxes thoroughly; be cited a case where several officers were killed by contact with a box which had become

highly charged through a swinging ground on a power wire. Although fire-alarm manufacturers were inclined to oppose grounding the box, it is necessary to do this in order to protect the public. A vacuum type of low-potential lightning arrester now on the market protects the box satisfactorily from lightning. A number of other speakers agreed with Mr. Fenton on the need and practicability of grounding the boxes.

F. L. Lucas brought up again the modification to Rule 38 as to motors in theaters, and on his motion it was decided to recommend the insertion of a clause specifying that all motors used therein, except portable motors, must be of the protected type or inclosed in approved fireproof compartments used for that purpose only. This is supplementary to the rule that curtain motors always be of the inclosed type.

A general discussion of other inspection problems followed. Among these considered briefly were the use of wood cabinets in electric traction systems, inclosure of sign flashers, emergency service for theaters, etc.

The Committee on Constitutional Revision reported that this subject was too important to be passed on hurriedly and recommended that this matter be deferred until the next convention.

Election of Officers.

The Nominating Committee, through James Bennett, chairman, submitted a list of nominees for officers for the ensuing year; these were unanimously elected as follows:

President, Ben W. Clark, Detroit, Mich.

First vice-president, H. M. Maxwell, Dayton, O.

Second vice-president, F. H. Moore, Indianapolis, Ind.

Secretary-treasurer, W. S. Boyd, Chicago, Ill. (re-elected).

Executive committee, H. B. Long, chairman, R. J. Swain, G. W. Strachan, T. D. McColl, James H. Fenton, B. W. Clark, H. M. Maxwell, F. H. Moore, W. S. Boyd.

A resolution was adopted thanking the retiring officers and those who had been active in promoting the success of the convention. A beautiful floral gift was made to Mrs. W. B. Hubbell as a special mark of appreciation of the valued services rendered by the chairman of the general arrangements committee. By resolution the standing committees were requested to send their reports to the secretary at least 30 days before the next annual convention. The Executive Committee has decided that this shall be held in Minneapolis, Minn., in January, 1915.

Entertainment.

The chief entertainment features of the convention were a smoker on Tuesday evening and the annual banquet given by the manufacturers on Wednesday evening. L. T. Milnor, of Cincinnati, acted as toastmaster. The speakers were Messrs. Cleveland, Clark, Bennett, Bloomer, Long, Canada, Flickinger, Tousley, Beattie, Maxwell, Gilsdorf, Dustin, Hornsby, Hubbell, Glover, Nelson, Boyd and Healy. Good fellowship and co-operation were the key notes of the speeches. On Friday those members remaining in Cincinnati made an inspection tour of prominent points of interest, especially the new waterworks and filtration plant of the city.

Exhibits.

During the convention exhibits were made by a number of manufacturers as follows:

Cincinnati Clock & Instument Company, Cincinnati, O.; Nelson mechanical sprinkler supervisory system.

R. J. Dotson, Highland Park, Mich.; illuminated low-voltage house number.

Economy Fuse & Manufacturing Company, Chicago, Ill.; renewable cartridge fuses.

Frank Adams Electric Company, St. Louis, Mo.; cutout cabinet and meter panel.

Western Association of Electrical Inspectors Assembled for Annual Banquet, Cincinnati, O., January 28, 1914.

General Electric Company, Schenectady, N. Y.; sockets, receptacles and other wiring specialties and supplies.

National Metal Molding Company, Pittsburgh, Pa.; metal molding and fittings, flexible steel cable, fiber tubing.

New Process Specialty Company, Milwaukee, Wis.; clamps and bushings.

Pass & Seymour, Incorporated, Solvay, N. Y.; sockets, receptacles, and other wiring specialties.

Star Electric Company, Binghamton, N. Y.; fire and police alarm and signaling apparatus.

T. W. Manufacturing Company, Chicago, Ill.; bushings and clamps.

The Western Conduit Company, Youngstown, O.; rigid conduit, flexible steel conduit.

The Engineer and Utility Regulation.

At the alumni reunion at the Stevens Institute of Technology on January 9, already mentioned in these columns, a symposium was held on the subject "The Engineer's Part in the Regulation of Public Utilities." The subject was introduced by Alexander C. Humphreys, president of Stevens Institute. The subject was discussed by Newcomb Carlton, vice-president of the Western Union Telegraph Company; John W. Lieb, Jr., vice-president of the New York Edison Company; and James E. Sague, public service commissioner for the Second District of New York. Below is given an abstract of this discussion.

Alexander C. Humphreys.

The many questions involved in the management and regulation of public utilities are difficult to discuss without creating misunderstandings. Representatives of the public utilities can best meet the criticisms which are showered upon them today by showing the public that they have nothing to conceal; that they are conducting their business honestly; that they can give the maximum of service for a given rate of charge only by securing the confidence and good will of the public and that they intend to do all in their power honestly to gain that good will and co-operation. Theodore N. Vail, in a recent address, stated that the great bulk of the public are honest and will act honestly according to their lights. This does not prevent them from acting unjustly and even cruelly if they are uninformed, or still worse, if they are led astray by ignorant enthusiasts. Mr. Vail has shown his willingness to co-operate with the constituted authorities, even to the abandonment of his own matured plans. The speaker's personal relations with the members of our public service commissions have generally been most pleasant, but he has had experiences which have been nothing short of disgusting and disheartening. Several instances were mentioned. Many commissions have never established any definite policies and the corporations are left to flounder in a sea of uncertainty. The honest and capable manager is unable to determine even with the aid of the best legal advice obtainable what he should do and what he should not do to comply with the laws and commission requirements. This condition is also to be found wherever the Federal Government is in control. No commission or any other one government authority should be placed in office to exercise the three functions of government, legislative, executive and judicial, which should be kept separate and distinct from each other. There should be some measure of control of public utilities, particularly if these utilities are to be protected in monopoly. The monopoly argument is always advanced by advocates of control, but the utilities are not always protected in their monopoly. The arguments that can be advanced in favor of regulating public utilities do not serve to support the present tendency toward the regulation of all business. The speaker favors a proper measure of control and regulation such as will tend to insure to the public efficient and economical service and attention to complaints, together with a just and discriminating control over return on investment. The record of personnel of utility commissions is not good. Appointments are too often based upon political grounds and the men appointed are not qualified to exercise the great power placed in their hands. Many of the questions which the commissions are called upon to determine require for their solution the highest engineering training and experience, yet it is the exception when an engineer is appointed as a commissioner. The engineering profession is most often represented not as members of the commission but as employees without vote. Frequently the engineers so employed as subordinates are not qualified for an authoritative position in any of the companies over which they are indirectly given a large measure of authority. The engineering profession should be adequately represented on every one of these commissions by men educated in the science of engineering and later trained in the hard school of experience. These men should be voting commissioners. Because a man is an engineer does not mean that he is necessarily qualified for membership on such a commission any more than a man is qualified to be a judge because he is a lawyer. He should also be broadly trained, having had administrative experience. His character should be above reproach. He should be judicial in temperment and should be free from the temptation of playing to the gallery. There is no class less fitted to be commissioners than statisticians who have not had experience as administrators. All the productive processes of life have to do in one way or another with the science and practice of engineering and it seems extraordinary that the members of the engineering profession should have been permitted to enter to such a slight extent into this field of government control. The fault is, however, not entirely with the public and the appointive power. Engineers as a class are themselves in part to blame for not taking a more active part in the administrative side of life and deliberately equipping themselves for administrative responsibilities. There are, however, sufficient engineers in the country specifically and broadly trained to do their full share of work on the commissions of the country, but they should be selected with regard to their breadth of training quite as much as to their special training. The same rule should be applied in the selection from the ranks of other professions, particularly that of law. Every commission should have at least one engineer as a full member and it would be better if they were more fully represented than any other profession. The tendency has been to have lawyers largely in the majority. In the interest of efficiency that profession should be represented, but a lawyer is no more qualified for this duty because he is a lawyer than is an engineer because he is an engineer. A board composed of five broadly trained engineers with a competent lawyer to advise them would be superior to one made up of five well equipped lawyers as commissioners with one competent engineer to advise them. The best results would be obtained by selecting the majority of commissioners from the professions of law and engineering. In conclusion, two points should be emphasized: (1) the great corporations which are often thought to be a menace to the country have not won their successes by financial legerdemain. Great problems had to be solved by patient, persistent and determined work and were often accompanied by temporary failures; (2) legislation and regulation which will stand the test of time and create justice to both producer and consumer must take full account of the inherent physical and financial limitations within which utilities are forced to operate. To this end men technically trained must have their full share in the formulation of laws and their administration.

Newcomb Carlton.

The speaker agreed with Dr. Humphreys that the personnel of public service commissions in general is far from satisfactory and that the commissions would be more equitable, judicial and competent by the addition of technically trained and experienced engineers. He could not, however, conceive of engineers in any number that fulfilled Dr. Humphreys' requirements and were available. An engineer possessing them is much sought after and can secure positions and emoluments which place him beyond the call of public service commissions as now constituted. One great difficulty of the commissions lies in the fact that appointments are temporary and judicial, legislative and executive functions must be exercised almost without precedent,

without familiar methods of procedure, without practical experience and with superficial hearings. To overcome this, commissions should be advanced as nearly as possible to the present status of a court. The question of control and regulation is on trial and commissions must be elevated above the status of a partisan political body, eliminating as far as possible popular clamor or the selfish demands of political or corporate interests, or else we are doomed to failure, and government ownership and socialism will be the result. He considered it an anomaly to have the law create a commission which makes the rules, prosecutes under them, acts as judge and imposes the penalty.

John W. Lieb, Jr.

Mr. Lieb sketched the origin of the idea of regulation by public service commissions and stated that to handle the important economic, commercial and engineering problems and matters of public policy which may come before them requires a personnel of a high order—far above the level of capacity of the ordinary office-seeking politician. Men of the highest personal integrity are required, with ability and capacity; minds capable of statistical analysis; judicial temperament; a wide knowledge of public affairs and a sufficient interest in the public service to devote the necessary time to the study of a mass of detail. No single individual can possess the wide knowledge of public affairs, the legal training, business experience, breadth of learning and scientific knowledge necessary to cover competently so vast a field. It is obvious that the presence of a technically educated and scientifically trained member on the commission should be of enormous assistance and value in its work, only second in importance to a representative of the legal profession. There is also a demand on the side of the utilities for broader knowledge, wide experience and high capability on the part of executives, managers and engineers. Technical graduates should be trained so that when called upon for facts or to present evidence or testimony in utility cases, their presentation shall be clear, convincing, to the point, and delivered with authority. The habit of clear statement should be cultivated, as well as clear thinking. Questions of physical valuation, depreciation, adequacy of equipment, etc., are all matters which must be approached from the engineering standpoint; while other matters, such as value of property, rate of return, formation of rate schedules, etc., require something more than engineering knowledge and experience. Many of the questions involved in commission regulation are the results of the operation of economic laws. To have effective supervision and regulation of utilities the public must recognize the inherent monopolistic character of public utilities and protect the corporation against competition. The engineer should assume his proper share of the responsibility of helping to mold public opinion along right lines and see that the public is furnished with correct and reliable information, for it is only through an intelligent public opinion that we can hope for justice and fair treatment. The progressive engineer should be a close student of public questions, of economics and political science, and should be in touch with the trend of public opinion.

James E. Sague.

The speaker was glad to see engineers taking an interest in this subject, as he had long wondered why they leave so much of the discussion of fundamental problems of government to lawyers and politicians. He pointed out the importance of engineers in utility and commission work and said that for efficient operation enthusism is very necessary. Regulation must finally fail if the enthusiasm of the employees of utilities is not preserved. It is doubtful if this is so at present. There is a feeling of misunderstanding between the two elements involved, especially on the side of the state. There is too much misunderstanding of the problems which public-service managers have to meet and the delicate nature of the work they must do. The legal profession is usually represented on state commissions, and should be. Able lawyers can better afford to accept appointments than can engineers of equal grade. The career of the former is but little interrupted, while with the latter there is a serious interruption. The work put upon a commission by the utility laws is enormous and it is very difficult for any commission to cover the field satisfactorily. The commissions should make an effort to become well informed as to the general condition of utility properties and should accomplish results less by the issuance of orders than by conferences with utility managers. Patient study of finances, general conditions and service of the corporations should be followed rather than the methods of the courts. The Interstate Commerce Commission has accomplished two great things: (1) a systematic tariff with publicity of rates and a system of accounts which enables corporations to be compared on the same basis and compels honesty in report. These alone would justify the maintenance of the Commission, even if it had done nothing else. This example has been followed by many state commissions with much success. In other respects the work of the average commission leaves much to be desired. Too much time is given to minor complaints and too little to large questions. Legislation involving details of operation should be a matter of last resort. The commission of which he is a member has been helped to an astounding degree by the information given by the officers of utility companies and the patience shown. Municipal administrations on the other hand often impose difficulties.

Graduate School of Engineering at Columbia.

The School of Mines of Columbia University will in September institute a graduate school of engineering on the same footing as the other graduate schools of the university. This school will provide three years of specialized study in the various branches of engineering leading to technical degrees in mining engineering and chemistry.

The requirements for admission to these schools will be the completion of at least three years of a college or scientific school course, which shall include mathematics, chemistry, physics, drafting, shop works, surveying and mineralogy.

To prepare for this graduate course a new course has been prepared in the college leading to the degree of Bachelor of Science. A little more than one-half of the time of the student is given to required studies and the remainder may be selected from English, modern languages, history, philosophy and political sciences. No more undergraduate freshmen will be permitted to enter the engineering department.

Amendment to Patent Laws.

Congressman Oldfield, chairman of the Committee on Patents of the House of Representatives, has received from Clarence L. Burger a suggestion to amend the patent laws so as to reduce the present labor, expense, injury and delay of interference suits by making it the duty and privilege of the inventor to record his inventions or design and all subsequent improvements thereof as evidence in the Patent Office as soon as conceived and to file satisfactory evidence of his diligent actual reduction to practice within a reasonable time thereafter. The Patent Office should grant the patent in the absence of fraud to the first of record who has thus proven diligence in reduction to practice.

Another amendment is suggested to prevent the present injury to legitimate inventors of operative patents by the issue of inoperative patents by providing that the inventor should be compelled to prove to the Commissioner actual reduction to practice and operativeness before the patent is issued.

New Power Station of United Electric Light & Power Company.

The large new $6,000,000 power station of the United Electric Light & Power Company, 201st Street, New York, was formally opened on Saturday last. There was an attendance of nearly 1,000 invited guests, and the plant was thoroughly inspected. A Delmonico collation was served on the top floor of the building, which will eventually be used for offices.

Vice-president F. W. Smith, of the United Company, spoke briefly to the assembled guests immediately before luncheon, and introduced George B. Cortelyou, president of the Consolidated Gas Company, who spoke at some length respecting the new station, stating that it was the most modern and one of the largest of its kind in the world, and that it had been made necessary by the press of population in Manhattan northward. The station had been built, he stated, with a view to substantial additions in the future.

Among those present were: Nicholas F. Brady, president of the New York Edison Company; Frank W. Smith, vice-president and general manager of the United Electric Light & Power Company; James A. Farrell, president of the United States Steel Corporation; W. R. Addicks, vice-president of the Consolidated Gas Company; John W. Lieb, Jr., vice-president and general manager of the New York Edison Company; Thomas E. Murray, vice-president of the New York Edison Company; Commissioner Henry S. Thompson of the water supply department; Edwin W. Rice, Jr., president of the General Electric Company. L. A. Osborne and C. A. Terry, vice-presidents of the Westinghouse Electric & Manufacturing Company; Charles W. Price, H. C. Cushing, and F. A. Stratton, president of the Westchester Lighting Company.

The officers of the United Electric Light & Power Company are: President, Nicholas F. Brady; vice-presidents, Thomas E. Murray and F. W. Smith; secretary, Lewis B. Gawtry; treasurer, Benjamin Whiteley; contract agent, Joseph F. Becker.

The building contains seven floors and basement. The structure's exterior is of red brick, with an artificial granite base and terra cotta trimming, and a tile roof. It contains 15,000 tons of steel and is set in the mud on 6,600 piles. A section tunnel, ten feet in diameter, takes water from the Harlem River and dumps it into Sherman Creek after it has been used in the pumps and turbines.

The large turbines were supplied by the Westinghouse Electric & Manufacturing Company, and the immense boiler equipment by the Babcock & Wilcox Company.

The building is seven stories high and the electrical gallery is on the top floor. The sixth floor contains the bus tie switches and reactance coils. The fifth floor contains the bus compartments, while the oil switches are on the fourth floor, and the feeder and generator switches on the third floor. The control gallery from which the plant is operated is on the second floor, all switches being remotely controlled from the panels here. A storage battery is located on the first floor.

There are three 15,000-kilowatt turbogenerators of the high-speed double-flow type. Space has been provided for five additional units. There are 32 boilers of 650 horsepower each, provided with automatic stokers.

Design Registration.

Congressman Oldfield, chairman of the Committee on Patents of the House of Representatives, introduced a bill on January 12 providing for the registration of designs.

The purpose of the bill is to protect a manufactured article embodying a particular design. It extends protection to citizens of the United States and citizens of such foreign countries as a matter of course, no examination for citizens of the United States. Certificates are to be granted and issued as a matter of course, no examination being required except as to matters of form. Registrations are to be granted for different terms of years for different fees; a three-year registration being issued for $1.00, and one for 20 years for $30. It will be sufficient to defeat a charge of infringement of a registration to show that the design was old, embodied in the particular product at the time it was registered to the complainant, or that the design was not new and original. The question of validity and other questions affecting the rights are thrown entirely into the courts and applications for registration cannot be held up pending the determination of such rights.

A similar bill was introduced on the same day in the Senate by Senator James, chairman of the Committee on Patents.

The bill has been indorsed by the National Design Registration League, which was organized for the protection of designs by a registration law. The secretary is S. M. Weatherly, 1309 Race Street, Philadelphia, Pa.

Copper Exports.

Exports of copper for the week ended January 29 totalled 8,473 tons. Since January 1 they were 33,690 tons, as compared with 23,048 for the same period last year.

The Electrical Sterilization of Milk.

A paper was read at a meeting of the Rontgen Society by W. G. Duffield on the sterilization of milk by means of electrified gases. Prof. Duffield referred to the work recently done on the subject by Thornton and others, and notably by Priestly and Lee, who brought before the British Association in 1911 some experiments in which they had applied weak currents of electricity upon the "sour milk" bacillus of Metchnikoff. In one respect the conclusions of Priestly and Lee differed from those which he had to bring forward, for under certain conditions they got an increase of acidity after electrification, whereas he had found that the acidity was greatly reduced or retarded. The apparatus used in his own experiments, in which he was assisted by T. Murray, was a 15-inch induction coil, with a fairly fat spark 4 centimeters in length. The poles were of brass. The spark discharge was passed through a closed glass tube, and air or nitrogen, which in certain of the experiments was filtered through cotton wool, was sucked in, and made to convey the products of the discharge into samples of milk. The acidity of the milk was then tested at intervals of hours, and compared with the acidity of a control sample, which had not been treated. The testing of the acidity was carried out by discovering the amount of alkali necessary to produce neutralization in a given number of cubic centimeters of milk. It was at once found that the acidity of the treated samples was retarded. The acidity in the former case appeared quickly to reach its maximum, and then to remain stationary, whereas in the latter case it ran up rapidly. In one instance in which the electrical discharge had run for 52 minutes, the relative acidities at the end of 64 hours (as expressed in cubic centimeters of alkali necessary to produce neutralization in 10 cubic centimeters of milk) were 9 in the case of the control and 5.9 in the case of the treated sample. The effect seemed to be more pronounced the longer the electrical discharge had been allowed to run, notably in one case, for 71 minutes, whereas very short exposures of one minute or five minutes gave little or no difference between the two samples. The cause of the reduction in acidity was still doubtful. Some tentative experiments seemed to show that it was chemical rather than electrical in nature. A bacteriological examination proved that when the samples were sown on plates of agar and of gelatine, the inhibitory action in the case of the electrified milk had been as pronounced as the acidity tests had suggested. There was a marked diminution in the germ colonies in the samples, and it even appeared that the germicidal or toxic effect remained for at least five days after the original discharge.—*Electrical Review* (London).

San Diego Exposition.

Exhibitors who are planning outdoor exhibits and buildings to contain individual exhibits, and all concessionaires at the San Diego Exposition have been notified by Director General H. O. Davis that all buildings for exhibits or concessions at this exposition must be ready for installation by July 1, 1914.

Another month will see the completion of the great re-inforced viaduct over Cabrillo canyon, at the west entrance to the San Diego Exposition, permitting the hauling of material for the remainder of the exposition construction work over a much shorter and easier route.

The plantations and ground work are eighty-five per cent complete. Recent rains are causing the plantations to show wonderful growth.

Commissioners of the San Diego Exposition are now scattered over the United States, Europe and Central and South America, securing industrial and commercial exhibits, the exhibits of the arts and crafts, archaeological and ethnological specimens, manufacturers, and horticultural and agricultural exhibits that will fill the great exhibit buildings.

Unified Operation of Chicago Street-Car Lines.

On February 1 there went into effect the joint operation of all the street-railway lines in Chicago, this making the unified system the largest street-railway system in this country and probably in the world operated as a single unit. About 1,000 miles of electric street railway reaching all parts of the city are operated by the Chicago Surface Lines, which is the name of the new operating company. A universal system of transfers from any street-car line to any intersecting line, without doubling back, now prevails. The single five-cent fare limits have been extended to the remote southern city limits, thus making it possible to go from any point in the city to any other point for only one five-cent fare. The longest ride now possible for five cents is between the northern and southern city limits, a distance of about 28 miles. A number of additional through routes have been put in operation and these will be added to. Switchbacks and loops in the downtown district will be eliminated as far as possible.

New England Section Convention.

The sixth annual convention of the New England Section of the National Electric Light Association will be held at the new Mathewson Hotel, Narragansett Pier, R. I., September 2 to 4.

Water Shortage in Kentucky.

Kentucky electric light companies, especially those in the western part of the state, are having a lot of trouble on account of a shortage of water. The drouth last summer was followed by an equally dry fall and winter, and sources of supply which had been regarded as permanent are drying up. As a result many of the smaller electric light companies in the interior towns are being hard pressed and have advised their patrons of the possibility that the service will have to be temporarily discontinued. The Hickman Electric, Ice & Water Company has built a new artesian well, with a capacity of 300 gallons a minute, as the result of the shortage caused by the exhaustion of the city supply, while the Marion Electric Light Company has been hauling water a considerable distance on account of the drying up of a lake upon which it is accustomed to depend.

Prize for Non-Rubber Automobile Tire.

The Ministry of War of Austria-Hungary has offered $10,000 as a prize to be awarded to the person who will, with adherence to certain prescribed conditions, construct an elastic tire for motor freight wagons. Besides the specific attributes of pure rubber, such as elasticity and adhesiveness, the new material must possess (1) essentially greater durability, or (2) with equal durability the attribute of essentially smaller cost of construction than the rubber tires, thereby reducing the expense of operating motor freight wagons. Its weight must not exceed that of the pure rubber tire. Competitors should hand in a model of the fabric in natural or reduced size, together with drawing and description, at the latest by June 30, 1914, at the Automobil-Versuchsabteilung (Automobile Trial Division), VI. Gumpendorferstrasse 1, Vienna. Further details may be found in the Militärische Rundschau, published at I. Graben 23, Vienna, and to be had also on application in German of the K. K. Kriegsministerium, Vienna, Austria.

Improving Telephone Service.

"When you telphone, smile. A frown has spoiled the satisfaction of many a call." In a publicity campaign intendel to improve the telephone service in Pittsburgh, the Central District Telephone Company is using this, and the following advertisement, addressed to its subscribers through the daily newspapers.

"Are you interested in improved telephone service If you are, read this carefully. The service of 8,000 subscribers' lines in Pittsburgh was interrupted last month through the failure to replace telephone receivers securely on the hooks after completing conversations. Often the receivers were left off through thoughtlessness, but more frequently a book or some other obstruction directly beneath prevented the receiver from bringing the hook down firmly. Had our patrons exercised care in this respect 80 per cent of the service interruptions, with the enormous loss of communication to our subscribers, would have been prevented.

"Will you share our efforts to reduce the number of these service interruptions by watching closely your telephone receiver? Please remember that we are printing this advertisement because we want you to help us make our telephone service better."

Water Power in New York.

Governor Glynn has announced a policy of state control of water power, especially that at Niagara Falls, and believes that through state control the revenues of the states may be increased from $1,200,000 to $1,800,000 a year. The scheme is predicated upon the state taking absolute charge of the 4,400 cubic feet of water per second soon to be available at Niagara Falls under the treaty between the United States and Canada.

Governor Glynn's idea is that the state should either develop and sell this power itself or sell the water to companies for the generation of electric current. The estimate made by the governor of the revenue to be produced from this property does not appear to take into consideration the cost of development. He says that if 75,000 horsepower is sold by the state at the present wholesale rate in Buffalo of $16 a year a horsepower it would produce $1,200,000 a year, while if sold at the present Buffalo retail rate of $26 a horsepower it would produce revenue of $1,800,000 a year. But before this amount of energy could be sold there would have to be immense sums spent for plants for the generation of the power.

Second Annual Meeting of National Chamber of Commerce.

The Chamber of Commerce of the United States will hold its second annual meeting at Washington, D. C., February 11 to 13. Two days will be given to the subject of anti-trust legislation and the maintenance of resale prices. Among the speakers on the latter subject will be Joseph E. Davies, commissioner of corporations; William H. Ingersoll, of New York City; and Donald Dey, of Syracuse, N. Y. A report will be made by James G. Cutler, chairman of the Committee on Patents, Trademarks and Copyrights.

Depreciation of Power Plants.

In a paper presented before the American Society of Heating and Ventilating Engineers entitled "Life of Building Power Plants," C. M. Ripley has considered the proper percentages which should be applied for depreciation of electric power plants used for lighting buildings in New York City.

He cites a number of very old plants which are still in operation, one of which dates back 31 years, and others for lesser periods, indicating that the depreciation on these would not exceed values from 2 to 4.5 per cent per annum. The percentage of depreciation which should be charged off annually is based upon a sinking fund which earns 4.5 per cent compound interest. A plant which remains in service for as long as 15 years would consequently not require a depreciation of more than 5 per cent per annum.

The writer realizes that the above plants represent the survivors and that the values do not warrant any conclusions unless plants which have ceased operation during the same period are also considered. He consequently proceeds to consider all of the plants for which a certain New York firm acted as consulting engineers, the records covering a period from 1892 to the present time. Only plants started before 1900 are considered. Only one of these plants is now out of commission, owing to removal from the building; and only one other is in poor operating condition, owing to lack of proper maintenance. In none of them can a lower limit be set as yet to the actual depreciation, but the upper limits are set as follows: 34 show less than five per cent; of these, four show less than three per cent. Of plants started since 1900 only one is idle and that on account of change of policy of the owner.

The writer consequently considers the five per cent customarily allowed by engineers and architects for depreciation, as more than sufficient for this purpose.

Electric Poultices.

Some of the South Wales medical men are advising electric poultices for those suffering from stiff necks, colds and sprains. The poultice, which takes the place of the old-fashioned linseed, mustard and bread variety, consists of flexible electric wires covered with asbestos cloth, and when applied is connected with an ordinary lighting socket and it retains the correct temperature in a regular fashion. The highest heat is put at 160 degrees Fahrenheit.—*Electricity.*

Louisville Proposes City Testing Department.

An ordinance is now before the city council of Louisville, Ky., for establishing a department for the purpose of testing the meters and service of electric and gas companies. The chief company affected, the Louisville Gas & Electric Company, has asked for changes in the measure, on the ground that some of the provisions are unreasonable. The inspector will get a salary of $3,000 a year, while three deputies will receive $1,500 each. A clerk will be paid $1,200 a year. Rates of service will be examined and approved by the inspection department, which will receive and investigate all complaints, reporting the result to the complainant as well as the company whose service is complained of. Special reports to the mayor and the board of works will be made if the service falls below standard, while monthly reports of routine work are also to be made. Testing stations will be set up at the City Hall and at other points between one and two miles from the plants of the companies. The companies must run special service pipes and wires to these stations. Each meter must be approved by the inspectors before being installed. Detailed regulations for testing the meters and correcting overcharges, if any are discovered, are provided, and penalties are provided for failure to furnish the required voltage. The ordinance is now in the hands of the Grievance Committee.

Ordinance Governing Poles.

The City Council of Pauls Valley, Okla., has passed on ordinance requiring that all telephone and electric light poles shall be placed two feet inside the outer edge of parkings in residence districts, and inside and next to curb line of sidewalks in the business districts, and that all poles not so placed must be removed within ninety days. Failure to do so is punishable by a fine of $100 per day. The ordinance is directed primarily at the Pioneer Telephone and Telegraph Company, which will have to move all of its poles. Inasmuch as its franchise has expired it is understood that it will not be allowed to replace them except by express permission of the city. The company probably will take the matter into court.

Fire at Grandfield.

The electric light plant at Grandfield, Okla., owned by J. A. Branham, was totally destroyed by a fire which was started when a hot exhaust pipe set fire to one of the walls of the building in which it was housed. The plant was a new one, recently installed.

"Do It Electrically" Recognized by United States Post Office.

As an illustration of how thoroughly well recognized the slogan of the Society for Electrical Development, Incorporated, "Do It Electrically" has become, the following incident is of interest.

Recently in mailing a large number of booklets for the Society, the printers inadvertently let one envelope get into the mail without an address and without any contents. In other words, it was an empty envelope with a one-cent stamp on it. There was no return address printed on the envelope, but in the upper left-hand corner it read "Season's Greetings—Do It Electrically." The empty envelope was returned to the office of the Society for Electrical Development with annotation in pencil under the slogan "29 West 39th Street." This is certainly a very definite recognition upon the part of Uncle Sam of the identity of headquarters of the slogan.

Electric Iron Production on a Large Scale.

The well known Stora Kopparbergs Bergslag Company, in Dalecarlia, Sweden, has prepared plans, ready for being realized, intended greatly to increase the company's production of iron and steel. The plans comprise an increase from 100,000 tons to 300,000 tons annually, of which 200,000 tons are to be manufactured electrically. This imposing increase in the output (which means an increase of 25 per cent in the annual production of iron for all Sweden) will require 60,000 to 70,000 electric horsepower, obtained from an increased exploitation of the company's own waterfalls, besides an increased annual output of some 500,000 tons of ore from the company's own mines.—*Engineering.*

Tule River Plant Operating.

After eleven years of continuous work and the expenditure of millions of dollars, the Tule River plant of the San Joaquin Light & Power Company, in the foothills near Porterville, Cal., has just been put in actual operation. Over a double transmission line 35 miles in length current from the plant, representing 5,000 horsepower, is delivered to a substation north of Porterville, whence it is distributed to points throughout the oil fields and Kern County.

The Supreme Court of Pennsylvania will be asked to review the decision of Judge Josiah Cohen that gives the City of Pittsburgh the power to force the Duquesne Light Company to remove its poles and place its wires underground along Main Street and Wabash Avenue in the West End of that city.

Electric Power in Sweden.

United States Consul Douglas Jenkins, of Goteborg, Sweden, in a recent report states that the development of hydroelectric power in Sweden is being greatly extended. The city of Boras (Alsborg County) has under construction a power station of 5,000 horsepower. Lindesberg, a town in Crebro County, is building at Ringaby a power plant of 800 horsepower. The city of Filipstad is constructing a lighting plant of 400 horsepower.

A number of distribution plants are also being built. Director J. Nilsson is erecting a power station of 3,000 horsepower near Odensfors. It is to co-operate with the Lindkoping power and lighting station. The Eskilstuna Iron Manufactures Company is building a power plant of 2,400 horsepower at Tunafors, and the Huskvarna Arms Manufacturing Company, of Huskvarna, is building one of 3,650 horsepower. The plant at Dejefors is being enlarged so that it will have a capacity of about 5,000 horsepower instead of its present capacity of 3,000 horsepower. Besides the power plants mentioned, there are several smaller ones under construction in the country.

At many places extensions of electric plants have been made for the use of the wood-pulp paper, and iron industries. At the large power plant at Bullerfors, belonging to Stora Kopparbergs Aktiebolag, in 1913 the last machinery fixtures were installed, giving the station a capacity of 30,000 horsepower, of which the largest portion is used for iron smelting at Domnarfvet.

The Uddeholms Aktiebolag has also finished its power plant of 23,000 horsepower at Forshult on the River Klahalven. It is to be used for the same purpose as that at Bullerfors. The Uddeholm Company has also commenced the construction work on a power plant in the Uva-River, likewise intended for the electric production of pig iron. Kockums Jarnverks Aktiebolag is extending its hydroelectric power plant in the Ronneby River so that the stations at Kallinge and Ronneby will have increased capacity. The Jaders Iron Works is building a power plant of 600 horsepower on the Arboga River, partly for factory use and partly for distribution, and a large enterprise in this line is being planned by the Arboga machine shops (Arboga Mekaniska Verkstader).

The power plants for the mining industry were increased considerably during 1913. The Guldsmedshytte Aktiebolag is building two power stations at Blankafors and Rockesholm, on the River Svartalfven, each of 2,100 horsepower, and Riddarhytte Aktiebolag is building one at Gislarbo (Wastmanland County) with a capacity of 1,500 horsepower. In the neighborhood of Ludvika two power stations of 650 and 220 horsepower are under construction for Aktiebolaget Ludvika Bruksagare. Nora Bergslags Grufvor are building dams at Rastalfskvarn to secure 550 horsepower from the waterfall there. Finally, it may be mentioned that the Norberg mines received power from the Kolback River, and Virsbo Aktiebolag from Norsbo. These stations are of 900 horsepower, as is also that of Ramnas Aktiebolag at Seglingsberg.

The paper and pulp mills have been compelled to make new arrangements by reason of increased demand for power. The Klippan Paper Mills is rebuilding its power plants so that the station at Klippan will have a capacity of 875 horsepower, and that at Forsmollan 500 horsepower. In the same manner the power plant at Havrestrom is enlarged by 2,000 horsepower. In Norrland a new power station is under construction for this industry. The Gidea and Husum companies built a station of 2,500 horsepower in Gide River, at Gidea, which is to furnish power to the Hornefors pulp mill.

Large Electric Steel Furnace Plant in England.

The first English plant devoted exclusively to making steel by the electrical process is being erected by the Stobie Steel Company, of Sheffield, on the banks of the River Tyne at Dunston near Newcastle. Ample property has been secured to provide for future extensions to the works. The plant will have the advantage of both rail and water transportation and seagoing vessels will dock at the company's wharves and be unloaded by modern wharf machinery. The railway sidings are all to be electrically operated.

The furnace room is a steel structure 250 feet long, 60 feet wide, and 50 feet high, with a bay 26 feet wide running the whole length. A testing laboratory for determining the thermal behavior of the steels and still another for the micrographic research so necessary to the steel industry will occupy a portion of the same building.

The furnace installation consists of one 15-ton electric furnace operating on three-phase current, which will be used for melting; one five-ton furnace, which will be operated on two-phase current and be used for refining; and one 300-pound furnace for ferroalloys, to be operated on single phase. The furnaces are to be operated from a steel platform.

Electric power will be generated as three-phase, 40-cycle current at 6,000 volts and the transmission line will be in duplicate from the supply station. The furnace switch house is of reinforced concrete, 25 by 25 feet, located adjacent to the furnace room and contains 11 panels of high-tension feed and switch gear. Access to this building is direct from the furnace platform as well as from the floor level. The transformers serving the cranes, auxiliary motors, and the lighting service are also located in this building. The current supply to the furnace is regulated automatically, which prevents the heavy fluctuations that would otherwise take place. The tilting is done by electric power.

A track runs down the center of the shop, and pig iron, scrap, and other heavy raw materials are unloaded from the cars by crane service and an electromagnet. Other such materials as lime, sand, dolomite, and magnesite will be delivered into the bay that parallels the furnace platform.

The furnace room is served with a 15-ton electric traveling crane, with an auxiliary hoist of five tons capacity. A 20-ton track scale is provided for the convenient weighing of heavy materials, including ladles with molten material. A 300-pound electrically driven hammer has been installed for testing samples of steel, while the main body is still in a molten state. The latter may also be used for work on furnace tools. A blacksmith shop and a few miscellaneous tools complete the mechanical equipment. The samples of steel are sent direct from the furnace platform to the sample driller, who passes the drillings through to the chemists in the laboratory for analysis.

The operation of this plant is expected to produce especially economical results. The melting loss from cold charges is not to exceed five per cent and the yield on ingots into billets is to exceed 92.5 per cent.

The important improvements claimed in the Stobie furnace over other types are enumerated as follows: Electrode hoists, controllers, and instruments are isolated from the heat and dust of the furnace. They may be placed in any convenient position in the furnace room or in a separate room if desired. Any electrode with its holder and connections can be removed from the furnace and replaced in a few minutes without the necessity of workmen mounting to the top of the furnace. This feature prevents shutdowns due to electrode faults. The furnaces are also supplied with an oil or gas burner for the purpose of burning in the lining, heating up the furnace after a shutdown, and for preheating steel, thus effecting a saving in the cost of current. The plant will be in full operation in February, 1914.

The above description of this interesting plant was prepared by United States Commercial Agent F. G. Bolles for Daily Consular and Trade Reports.

New Electrical and Mechanical Appliances

The Lyhne Floor Lamp.

There is frequent demand for a pedestal or floor lamp which may be placed adjacent to a reclining or easy chair so as to make reading, knitting or similar occupation comfortable at leisure hours. This demand has been met by the Beers Sales Company, 1005 Broad Street, Bridgeport, Conn., which has recently placed on the market the Lyhne floor lamp. This lamp is an adaptation of the well known Lyhne portable lamp which has come into extensive use for desk, table and piano lighting. Like the latter, it has an adjustable reflector and an adjustable shade so that the light may be directed in any desired direction and confined thereto. The present floor lamp has a telescopically adjustable standard, by means of which the height of the lamp can be changed from 36 to 65 inches. The base of the stand is massive, so as to prevent tipping over the outfit; its diameter is 8.5 inches. The reflector is of the parabolic type, and the shade is opaque. This type of lamp has been found serviceable also for use by dentists, draftsmen, musicians, etc.

Lyhne Floor Lamp.

High-Pressure Electric Pumping Equipment for the City of Boston, Mass.

The Westinghouse Electric & Manufacturing Company has entered into a contract with the City of Boston, Mass., for all the machinery and equipment for a central high-pressure fire pumping station. This contract includes six 3,000-gallon-per-minute six-stage centrifugal pumps; six 700-horsepower, 6,000-volt, 60-cycle motors; six 800-horsepower, 13,200-volt, 25-cycle motors; also the complete switchboard and controlling apparatus, the necessary traveling cranes, and all heavy piping and large valves for the complete equipment of the pumping station.

Each pump will be connected by a magnetic coupling on one end to a 700-horsepower, 60-cycle motor and at the other end to an 800-horsepower, 25-cycle motor. Under normal operation each pump is driven by its 60-cycle motor furnished with current from the lines of the Edison Electric Illuminating Company of Boston.

However, should in any case a mishap occur to the 60-cycle supply, the pump can be instantly operated by its 25-cycle motor fed from the lines of the Boston Elevated Railroad Company. The increased size of the 25-cycle motor is due to its speed being 732 revolutions per minute, while that of the 60-cycle motor is 702 revolutions, these speeds of course being determined by the respective frequencies of the circuits.

The motors have wound secondaries, and they do not start until the first point of the automatic controller has been passed. At this point the circuit of the magnetic clutch between the motor and the pump is completed. The 800-horsepower motors will be the highest voltage wound-secondary motors ever built—13,200 volts being the potential for which it is designed. The high-pressure station is to be located between the Boston Commons and the Public Gardens.

The business district is to be underlaid with special high-pressure water mains to be used for fire service only, and in case of fire within this district, the alarm is sounded in the pumping station, and in the fire houses simultaneously. This permits the electrically operated pumps being started at once, and the pressure raised in not more than 45 seconds, to 300 pounds per square inch all over the system of high-pressure mains. Upon arrival of the fire hose at the point of the fire, the hose can be connected directly to the special high-pressure hydrants, and water taken directly from the mains at sufficient pressure to render the use of steam fire engines unnecessary.

This is a system which is rapidly coming into favor in congested business districts, as it gives increased protection for high buildings and makes it entirely unnecessary to run through the dense traffic of such districts with heavy engines.

Willey Single-Phase Portable Drill.

Many drilling operations cannot, or at least cannot conveniently, be performed by bringing the work to the tool; therefore tools have been developed which can be brought to the work. Along the line of such portable tools, the James Clark, Jr., Electric Company, of Louisville, Ky., has been directing much attention in recent years and has orginated and developed an extensive line of electrically driven portable semiportable and stationary tools on the Willey designs. Among these tools are drills, reamers, grinders and buffers.

In the accompanying illustration is shown a portable electric drill designed particularly for use on single-phase alternating current; it can also be used on direct current as well. This tool is of light and compact construction, but is so built as to be able to withstand all of the hard knocks attendant on such service. The thumb switch is so located in the handle as to be very convenient for the operator to start and stop the drill without appreciable effort; moreover, he can work with the tool from either the side or the end. These portable drills are made in many different sizes and types.

Willey Portable Drill.

As soon as the operator becomes accustomed to a power-driven drill, he is soon enabled to do about ten times as much work as a man operating a hand-driven drill. The latter has not only to operate the drill, but must also direct it. This causes much unnecessary breakage of drills. The electrically driven drill, on the other hand, needs merely to be directed, and therefore results in a very large saving of time.

labor and cost in drill renewals, etc.

The drill shown is designed for 110 volts. Slightly larger drills are made for 110 and for 220 volts. The maximum horsepower of the motor in the type illustrated is one-eighth horsepower, and the approximate spindle speed is 1,000 revolutions per minute. The weight of the machine, including the chuck, is six pounds; its total length 11 inches. The motor frame is three by three inches. An interesting feature of the drill is that the spindle is offset $\frac{1}{16}$ of an inch. This feature is valuable in making the drills serviceable in many places, such as corners, where a central spindle would limit its use. The drill shown can be used for holes up to three-eighths of an inch in hard wood, or up to one-quarter inch in metal. It is provided with a durable flexible cord and attachment plug and can be connected to any convenient lamp socket or receptacle. The drill is entirely self-contained and is ready to run when unpacked and connected.

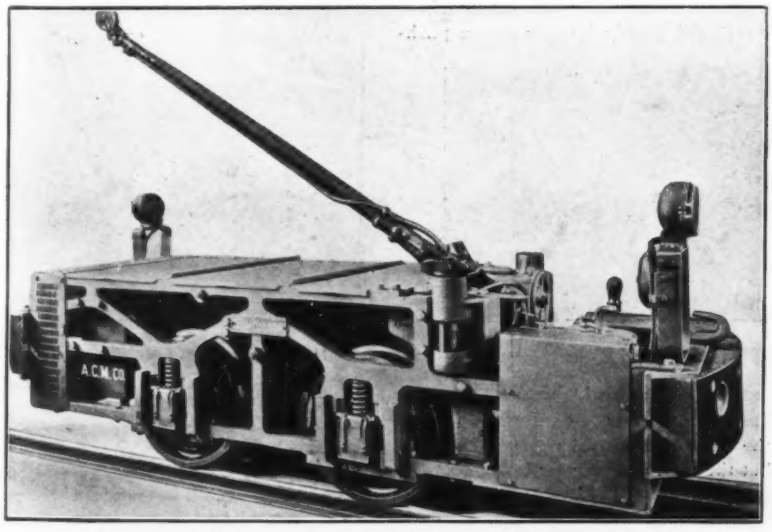
Historical Exhibit of Arc Lamps.

Anaconda Electric Mining Locomotives.

The Anaconda Copper Mining Company, Butte, Mont., has recently ordered 17 3.5 and 4-ton electric locomotives for underground haulage. The locomotives will be of the open bar-steel frame type of construction, each equipped with two 11-horsepower commutating-pole motors representing the latest advance in mining locomotives for narrow-gauge haulage. The Anaconda Company and its subsidiaries probably use more locomotives underground than any other metal mining company in the United States. This company has in the past preferred the standard steel-plate construction of locomotive, sometimes referred to as the armor-plate design. However, about a year and a half ago one of the associate companies purchased, somewhat in the nature of an experiment, three open-frame bar-steel mine locomotives.

These machines have been in constant service ever since they were installed, not requiring any mechanical or electrical repairs with the exception of the renewal of the brake shoes.

On the strength of this performance, the Anaconda Copper Mining Company decided last summer to purchase five four-ton bar-steel frame locomotives with commutating-pole motor equipment for certain surface haulage, and the operators found this type of construction so satisfactory that this type of construction was specified on the recent order referred to.



Baldwin-Westinghouse Locomotive for Anaconda Copper Mines.

Progress in Arc Lighting and Lighting Carbons.

A public exhibit of more than passing interest has been shown recently by the National Carbon Company at the show rooms of the Cleveland Electric Illuminating Company, in Cleveland, O. The progress of arc lighting and arc-lamp carbons is brought out in an interesting manner. The accompanying photograph shows the arrangement of the lamps and carbons.

The open arc lamp on exhibition is of the type invented by Charles F. Brush, of Cleveland. This lamp is one of the first commercial arc lamps to be used in this country. The first demonstration of arc lamps for which the current was furnished by mechanical means, was held in the Public Square in the city of Cleveland in the summer of 1876, and afterwards in the fall of the same year, the apparatus was set up at the Centennial Exposition at Philadelphia. The exhibition in Cleveland was extensively advertised in the newspapers, and on the evening it took place there were thousands of people assembled, nearly everyone carrying pieces of smoked or colored glass to protect the eyes from rays expected to rival those of the sun.

The following general classification of arc lamps can be made in the order of their development: (1) the open arc lamp; (2) the inclosed arc lamp, including the miniature or intensified arc; (3) the inclined-trim flaming-arc lamp; (4) the long-burning vertical-trim flaming-arc lamp. The first two types of lamps mentioned burn electrodes of pure carbon and are often called pure-carbon arc lamps. The light from the pure-carbon arc comes

almost entirely from the incandescent points of the carbons, but very little coming from the arc stream itself. In distinction we have what is known as the flaming arc. Electrodes of this class contain chemical compounds which vaporize in the arc and give their characteristic color to the light. There are two general types of these electrodes, the cored and the solid impregnated electrode. In the former type the flaming material is placed in the core, while in the latter type the flaming material is incorporated in the carbon body. The light and color-giving materials used are essentially the same in either case, although the service demands that they be used in different amounts and relations to each other. The greatest part of the light from the flaming arc comes from the arc stream itself, rather than from the carbon tips as in the pure carbon arc.

Testing Air-Break High-Tension Switches Under Ice Conditions.

To check the series of tests conducted last winter as to the effect of ice formations on pole-top switches, the Delta-Star Electric Company, Chicago, Ill., has mounted switches on its factory roof and is continuing the series of tests.

Fig. 1 shows a 33,000-volt three-pole switch in closed position after being subjected to a heavy spray of water for several hours. Fig. 2 shows the same switch in open position.

The fact that these heavy ice formations did not prevent operation of the switch is most interesting, showing as it does the progress made in commercial forms of pole-top switches. As transmission systems increase, the importance of having switching devices whose operation cannot be affected by severe winter conditions is beginning to be appreciated by operating engineers. The series of Delta-Star tests, of which this is but one, form an interesting chapter in the history of outdoor substation developments.

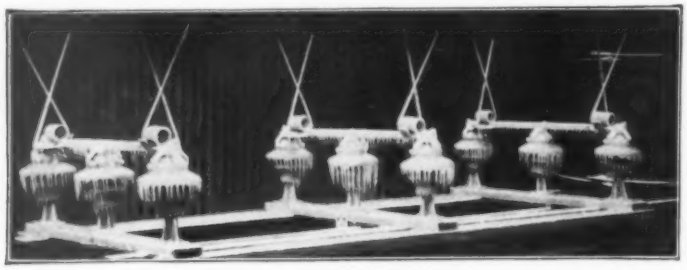


Fig. 1—33,000-Volt Switch Undergoing Ice Test.

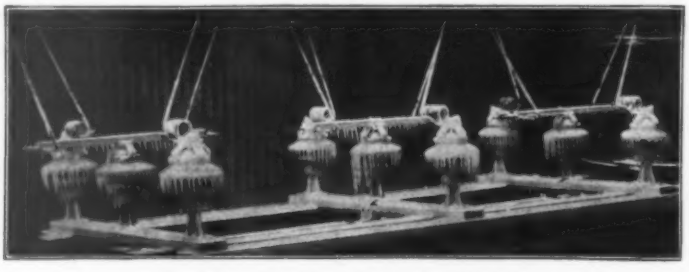


Fig. 2—Same Switch Opened Despite Ice.

Nodaz—A Headlight Glare Reducer.

One of the most ingenious of the automobile accessories recently exhibited at the New York Automobile Show was the Nodaz lamp manufactured by the Ward Leonard Electric Company, Bronxville, N. Y. This lamp is a device invented by H. Ward Leonard, which satisfactorily meets the conflicting demands of the motor-car drivers and city authorities in regard to headlights. The illustrations shown herewith indicate the general design of the apparatus. It consists of two pairs of translucent wings mounted on pivots or bearings fastened in the headlight reflector. These wings are made to open and close by electromagnets situated inside the cover of the lamp itself.

When running in the city, where it is necessary to use reduced light in the headlights and avoid glare, the wings are closed simply by pressing a push-button conveniently situated on the dash, or other part of the car. When the wings are closed there is no glare, but the road near the car is flooded with strong, diffused light, a fact which makes the Nodaz device particularly valuable when rounding sharp curves. At any moment when it is desired to use the full illumination of the lamp it is only necessary to push another button which opens the wings, and the concentrated searchlight beam is at once available.

When in the folded or open position, the wings do not perceptibly affect the light given off by the lamps, as they are very thin and are so placed that when folded they do not appreciably obstruct the rays of the headlights. The electromagnetic control is extremely convenient, and it takes only a small current from the battery just at the moment when the wings are either opening or closing. That is, there is no continuous drain on the battery, and the power required for operating the electromagnet is less than half that required by the average electric horn.

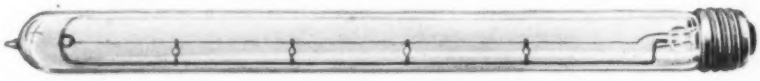
A great advantage of the Nodaz device is that it may be attached to practically any headlight now in use at small cost, and requires no knowledge of electricity to assure its constant use.

Nodaz Lamp with Vanes Open.

Nodaz Lamp with Vanes Closed.

The Mazda Show-Case Lamp and Reflector.

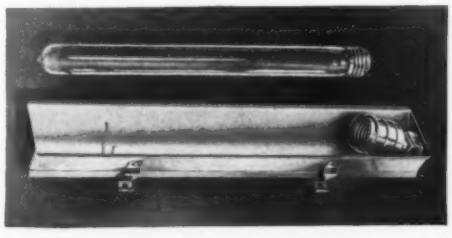
One of the most interesting developments in incandescent lighting is the Mazda show-case lamp, an illustration of which is shown herewith. There is always a demand for an efficient show-case lighting unit and there has been a very consistent demand for a long lamp unit which could be operated on multiple circuits. Considerable difficulty has been experienced in mounting the length of filament necessary for a 100 to 130-volt lamp without sagging or short-circuiting. In this case the new type of concentrated filament afforded a very satisfactory solution, since with this style of filament the over-all length can be greatly reduced. The mounting of the filament consists of a piece of iron wire lying against the glass and running lengthwise in the bulb. At intervals along the length of the filament are supports attached to but insulated from the iron wire. The iron wire forms the return circuit. The new lamp is one inch in diameter and 13 inches in over-all length. It has a medium sized screw base, so that it fits into an ordinary lamp socket. The lamp is made both in 25 and 40-watt sizes.



New Tubular Mazda Lamp for Show Cases.

A special reflector has been designed to go with this lamp, the complete unit giving a measure of satisfaction that approaches very nearly to perfection.

The reflector when in position in the upper front angle of a show case, occupies a space 14 inches long, 2.5 inches wide and 2 inches deep. It has a new interior finish of what is known as Cleanezy aluminum, giving it a very efficient reflecting surface. The design of the reflector is such as to present a neat appearance, give an effective distribution of the light and to shield the eye from the high brilliancy of the filament.



Trough Reflector for Tubular Show-Case Lamp.

The new unit can be readily installed by raising the top of the show case, supporting the reflector from the upper edge of the upright glass front by means of two brass brackets, then replacing the upper glass plate. The brass brackets just fit the thickness of plate glass ordinarily used in show cases. By mounting the lamp socket on a hinge, removal or insertion of the lamp is readily provided for even when the reflector is in place. To prevent the lamp from swinging out from its proper position in the reflector, it is rigidly held by a wire clasp situated on the reflector near the tip of the lamp. A row of these reflectors can be used along the upper front edge of the show case close enough together so that no open gaps are left; if desired, however, the units may be placed at intervals along the case. If the reflectors are placed close together a sliding brass molding on the back of the reflector protects and conceals all the wire. If the units are placed at intervals, short lengths of round brass tubing may be used to conceal the wire between the units.

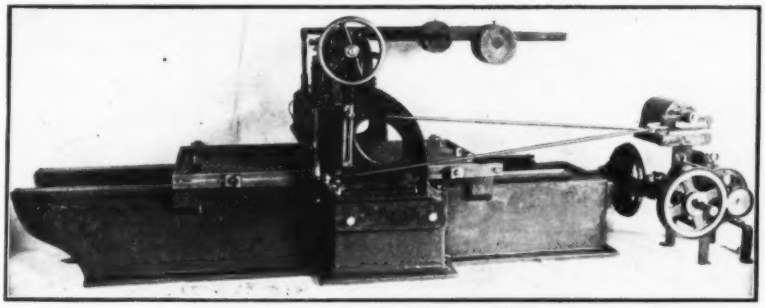
This new unit is being placed on the market by the Holophane Works of General Electric Company, Cleveland, O.

Westinghouse Employees Organized.

The American Federation of Labor began on January 26 an organization campaign among the 12,000 employees of the Westinghouse Electric & Manufacturing Company, following a reduction in working hours from 9.5 to 8 hours, with a corresponding cut in wages. Mass meetings were held every night during the week. The company is making no effort to check the union movement, which has resulted in the organization of an independent union with 9,000 members. Employees of other Westinghouse shops will join.

Motor-Driven Lithographic-Stone Planer.

The illustration herewith shows the Litho stone planer manufactured by the Fuchs & Lang Manufacturing Company and driven by a Diehl motor. This machine planes lithographers' stones absolutely true. It works automatically and when started requires no further attention. The drive, which was designed by the Diehl Manufacturing Company, was devised to overcome a serious objection, this being the use of the ordinary flat-bed stone planer with the double belting from overhead shaft, and consequent noise when the belt is shifted at each reversal of the planer bed. These difficulties have been overcome with the installation of a commutating-pole, reversible motor, operated by a self-starter and reversing switch, the latter controlled by a rod attached to the bed of the machine. Motor operates at approximately one and three-fourths times as fast in the reverse direction when not cutting as in the forward direction when cutting. The power transmission is from motor to machine by rawhide pinion and cast iron gear and thence through worm drive, this feature making it unnecessary to use a dynamic brake for quick stopping.



Motor-Driven Lithographic-Stone Planer.

"Exide" Dinner.

The Electric Storage Battery Company gave its annual "Exide" dinner to the electric vehicle manufacturers, dealers and "Exide" distributors, on Wednesday evening, January 28, at the Mid Day Club in Chicago, in accordance with its custom for the past six years.

Herbert Lloyd, the president and general manager of the company, presided. In accordance with the custom of this dinner there were no speeches, the guests being entertained with an attractive and spirited vaudeville and cabaret show, which was thoroughly enjoyed by the 250 guests present. The guests of the company included prominent officials of the Baker, Rauch and Lang, Chicago Electric, Borland-Grannis, Ohio Electric, Broc, Waverley, Walker, Argo and General Vehicle Companies.

Electric Automatic Railway Signaling System Used in England.

Considerable attention has been directed to a system of automatic signaling that has been successfully tested by the Great Western Railway. Although this device has been experimentally used on a short branch line for some few years, its installation on a larger scale has only recently received public attention.

The Great Western Railway Company possesses a larger mileage than any other railroad in the United Kingdom, the total length at the close of 1912 exceeding 3,000 miles, or, including sidings, 6,853 miles in equivalent of single track. The total train mileage worked during 1912 was 49,831,504, of which passenger trains accounted for 30,191,356 and freight and minerals traffic for 19,640,148.

The audible cab-signaling apparatus was first installed on the Henley branch in 1906 (6 ramps); this was followed later by its adoption on the Fairford branch (14 ramps); the main line from London to Reading (190 ramps); and the Lambourn Valley branch (4 ramps). In all, about 140 miles of main-line track have been fitted with the apparatus. The question of installing the invention throughout the entire system is under consideration, and it is not improbable that other companies may adopt the system.

The following is a slightly condensed description furnished by the general manager, Great Western Railway.

The apparatus consists essentially of a switch at the signal cabin, a ramp fixed in the center of the running rails, a shoe, a switch operated by the shoe, an electromagnet, an automatic steam switch, a polarized relay, a bell, a whistle or siren, a push, a resetting lever, and a four-volt accumulator on the engine.

The switch at the signal cabin is for connecting a battery to the ramp when the "all right" signal is to be given. Eighteen sac cells are used. The ramp is fixed in the center of the running rails, but not parallel thereto, being staggered three inches out of center at each end. This is to insure an even wear of the shoe. The ramps now used on main line are 39 feet long; some of the earlier ones are 60 feet. The shoe in its normal position is 2.5 inches above rail level, and in passing over a ramp which is four inches above rail level is lifted 15 inches, which interrupts the electromagnet circuit by means of the shoe switch. Providing no current is received through the ramp from the signal box, the armature of the electromagnet drops and opens the whistle valve or siren and vacuum-brake valve, whichever is provided on the engine.

Normally the electromagnet is in a closed circuit, the armature of which forms a lever which controls the whistle valve or siren and vacuum valve. The electromagnet has been constructed so as to hold its armature for maximum boiler pressure. The automatic steam switch is in the closed circuit of its electromagnet and is retained automatically by steam pressure until the pressure becomes less than 40 pounds. This device is to save battery power while the engine is not in running order.

The polarized relay has two armatures; when the "all-right" signal is given, a negative current to ramp is picked up that deflects the armatures to the right and completes two circuits; one rings the bell and the other bridges the shoe switch, thereby retaining the permanent current through the electromagnet and thus suppressing the danger signal.

The push is used to stop the bell ringing. The push returns the bell armature of the polarized relay to its normal position after a bell signal has been received, this disconnecting the bell circuit. The resetting lever is used to restore the armature of the electromagnet, which closes the valve of whistle or valve of vacuum brake and siren after the danger signal has been received. The accumulator is in the closed circuit, energizing the electromagnet to hold up the armature against the poles. This accumulator also provides power for the bell circuit.

On single lines the distant signals generally are fixed at danger and the ramp in these cases is not normally energized, the danger signal being received on the engine when the shoe passed over the dead ramp. In the case of an uptrain passing over the ramp of a down distant signal, and vice versa, the driver receives no signal at all. This is accomplished by connecting a positive or neutralizing current to a down distant ramp when an uptrain is in the section, or to an up-distant ramp when a downtrain is in the section.

Where the electric tablet system is in use the neutralizing current is connected to the ramp by a contact in the tablet instrument brought into operation when the tablet slide is fully drawn out. Thus when a tablet is out for an uptrain from station A to B, A's down distant ramp receives a positive current. When the engine passes over the ramp the armatures of the polarized relay on the engine are deflected to the left, which does not close the bell circuit but bridges the shoe switch retaining the closed circuit through the electromagnet, the armature of which consequently is not dropped and the whistle valve remains closed.

Where the electric train staff system is in use the neutralizing current is connected to the ramp by means of a contact on a lever interlocked with the electric train staff instrument. This lever must be reversed for a staff to be withdrawn, and if, for instance, a staff is drawn at station A for an uptrain, the lever having previously been reversed, A's down distant ramp is neutralized by the contact operated by this lever.

In case of the failure of battery at signal box, or if the switch at signal box is not properly closed, or if there is a breakage of line wire, the enginemen would receive the danger signal when passing over the ramp, as no current would be received, and the shoe switch would not be bridged. The closed circuit would be interrupted by the raising of the shoe, allowing the armature of electromagnet to drop, thus opening the valve of whistle or vacuum and siren. The failure of the accumulator on engine or a disconnection or short-circuit in electromagnet coils would immediately release the armature on electromagnet and give danger signal. In case of the shoe sticking up, the closed circuit would be interrupted and the danger signal would be given.

Electric Drive for Rail Mills.

The United States Steel Corporation is building a new plant near Duluth, Minn., which will be known as the Minnesota Steel Company plant. It will produce rails and structural material in large quantities. It has been decided to install electric drive in this mill.

Eight stands of rolls attached to a 28-inch rail mill will be operated by a motor of 6,000 horsepower. It will have a bedplate 28 feet long by 22 feet wide, weighing 105,000 pounds. The motor itself weighs 235.5 tons. This motor is now completed and a second one of 3,000 horsepower is now undergoing construction. It will be direct-connected to three stands of rolls of a 12-inch merchant mill. In addition it will drive nine stands of rolls of a 16-inch mill by means of a drive of ropes and beveled gears. The motors are of Westinghouse make.

Westinghouse Foremen's Association.

Most of the officers of the Westinghouse Electric & Manufacturing Company attended the twelfth annual banquet of the Westinghouse Foremen's Association at the Fort Pitt Hotel on January 24. A. M. Allison was toastmaster. The speechmaking was informal. The officers elected for the year are: G. W. Jones, president; Charles Champlain, vice-president; W. Langhorst, treasurer; P. J. Shiring, secretary; H. Bowen and A. M. Allison, directors.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

JACKSON, TENN.—This place has decided on the issuance of $25,000 electric light bonds.

PILOT MOUND, IOWA.—It has been decided to establish a municipal lighting plant here. C.

PORTLAND, N. D.—A municipal light plant is proposed. Address P. M. Paulson for information.

LA CENTER, KY.—The City is planning to construct an electric light plant here. Address the city clerk.

KEARNEY, NEB.—The Council is planing ways and means to establish a $12,000 municipal light plant.

RED OAK, IOWA.—About 75 additional electroliers will be installed. The Commercial Club is interested. C.

BLOOMINGTON, NEB. — Bonds for an electric light plant, amounting to $8,500 have been decided upon.

VERMILLION, KANS.—This town is planning to establish an electric light plant here. Address the town clerk.

MOORE, MONT.—The Moore Empire, a weekly paper, has started an agitation for a street lighting system. C.

RICHMOND, IND.—The Council is planning to secure municipal lighting. Address Mayor Robbins for particulars.

LOWELL, WIS.—W. F. Pease of this place is promoting the establishment of an electric light plant here and at Reeseville. C.

GUELPH, N. D.—Plans are being considered for an electric light plant. Mr. Schwarting is back of the movement. C.

HARDIN, MONT.—J. W. Johnson and A. L. Mitchell are working in the interest of the proposed electric light plant. C.

WESTBROOK, MINN.—The Commercial Club is considering the erection of an electric light and power plant. C.

BALDWIN, WIS.—The Baldwin Electric Company will install a generator, build a power line and furnish 24-hour service. C.

ST. CLOUD, MINN.—Leon Wiley will erect a power plant at Oak Park to furnish light and power for that village. C.

OVERTON, NEB.—The Council is planning ways and means to establish a $5,000 lighting system. Address the city clerk.

ROGERS CITY, MICH.—Rogers City Electric Light & Power Company, has been incorporated with a capital of $10,000.

ELDON, MO.—The Eldon Light & Power Company is planning to construct a street lighting system here consisting of 100 lamps.

CALGARY, ALTA.—About $1,000,000 will be spent on the Calgary Power Company's plant at Kananaskis within the next year. C.

MALTA, ILL.—A committee has been appointed to look up a lighting system for Malta. Address the city clerk for particulars.

GEORGETOWN, MINN.—The Farmers Elevator Company is considering putting in an electric light plant and furnishing the town with lights. C.

RED LAKE FALLS, MINN.—E. F. Wheeler is preparing plans and securing data as to the cost of constructing an electric lighting system here.

NEW CONCORD, O.—The New Concord Water & Electric Company, will issue bonds to be used in improvements. Address the secretary.

CANTON, MINN. — Root River Power Company is desirous of furnishing this town with electric lights and a line may be built from Harmony. C.

GREENACRES, WASH. — Greenacres Light & Power Company has been incorporated, capitalized at $3,000, by G. L. Wheeler and E. O. Stauke.

PAWNEE CITY, NEB.—Money is being raised for the installation of an electrolier lighting system here. Address the city clerk for information.

GOWER, MO.—The Gower Light & Power Company, has been incorporated with a capital stock of $10,000 by Curtis Poe, Allen Groom and others.

CATASAUQUA, PA.—Plans are being prepared for a new lighting system to be constructed here. Address the borough clerk.

BARSTOW, CAL.—The distributing system of the Southern Sierra Power Company is to be extended at once to cover the entire city.

SUMAS, WASH.—The Sumas Electric Company will rebuild one line of its system in this city at once, following an order issued by the Public Service Commission. O.

ST. JOSEPH, MO.—The city is planning to extend the arc-lamp circuits and will purchase about 2,500 pounds No. 8 weather-proof wire. Address A. L. Utz, superintendent.

MEDICINE HAT, ALTA.—The by-law for the extensions to the power plant calling for $150,000 has been passed. H. Baker is clerk and A. K. Grimer, engineer. C.

LOUISVILLE, KY.—Crutcher & Starke, clothiers, have leased the entire Equitable Building and will remodel it, the changes involving the installation of two electric elevators. G.

HERINGTON, KANS.—A bond issue of $49,000 has been voted for electric lights and waterworks. Benham Engineering Company, Oklahoma, Okla., has been retained as engineer. C.

WINNIPEG, MAN.—A by-law has been submitted providing for $1,000,000 for extensions and improvements to the hydroelectrical works and system of the city. C. J. Brown is city clerk. C.

PADUCAH, KY.—The Board of Public Works has asked for an appropriation of $16,500 for the construction of an electric light plant here. Address the Clerk of the Board of Public Works.

MELBOURNE, FLA.—An election will be held sometime in February to vote on the question of issuing $5,000 in bonds to construct an electric light plant. Address the town clerk for desired data.

MOUNTAIN HOME, IDAHO. — The Idaho Power & Light Company will soon begin work on a hydroelectric plant on the Malad River to have a total capacity of 15,000 horsepower. C.

MILWAUKEE, WIS.—The Council is asking for bids for a street-lighting survey by a firm of engineers, with a view to establishing an efficient modern lighting system. C. Corcoran is president. C.

NEW ULM, MINN.—J. F. Deuar, of the Oscar Claussen Engineering Company, Commercial Building, St. Paul, has about completed plans for modernizing the electric light plant here. C.

ELIZABETH, N. J.—The Broad Street Improvement Association has requested the City Council to install additional lights on Broad Street, to form a "White Way" of the main thoroughfare. A.

PORTLAND, ORE.—The City Commission has rejected all bids submitted for the installation of a new lighting system in the city hall, and Purchasing Agent Wood will re-advertise for bids at once. O.

LITTLE ROCK, IOWA.—Owing to the town being bonded to the limit for waterworks the citizens at a massmeeting subscribed $9,000 for an electric light plant. Address the town clerk for information.

BELLINGHAM, WASH.—J. P. De Mattos, mayor of this city, is investigating the cost of generating and distributing current and power with a view to establishing a municipal light and power plant. O.

OTTAWA, ILL.—A resolution was presented to the Council for the investigation of the cost of installing an electric plant at the pumping station for the purpose of lighting the city. Address the city clerk.

ARMOUR, S. D.—It has been suggested to build a dam on the Mississippi River at that point where Brule and Charles Mix counties join and create 25,000 horsepower of electricity to supply Sioux Falls. C.

VERGENNES, VT.—This city is considering the project of constructing a water filtration plant and a hydroelectric power plant to provide energy for the same and for street and other municipal lighting. W.

WARREN, MINN.—Earl D. Jackson, consulting engineer, St. Paul, has been employed to make plans and estimates of cost of improvements in the electric light and waterworks plant. Rasmus Hage is city recorder. C.

SACRAMENTO, CAL.—The Pitt River Power Company has been granted right of way by the Secretary of Agriculture for a power line approximately five miles long in the Shasta National Forest.

TROY, IND.—The town of Troy is to have an electric light plant. The Town Board has granted a franchise to DeHaven and McIntyre, of Hardinsburg, Ky., to install a plant for street and house illumination.

VANCOUVER, WASH.—The Pacific Power & Light Company recently filed a mortgage for $30,000,000 to United States Mortgage & Trust Company, New York City. It is understood that extensive improvements will be made. O.

COLUMBIA, TENN.—Dr. Otey J. Porter, secretary and general superintendent of the Citizens Telephone Company, has purchased a site to be used for a new addition to the present plant. Plans will be prepared at once and contracts let.

EUGENE, ORE.—The Oregon Power Company, A. Norman, local manager, contemplates increasing the capacity of its hydroelectric power plant in Albany, and the first step of the several improvements will be made early in the spring. About $10,000 will be spent immediately.

CITY OF MEXICO, MEX.— Antonio Villa Ahiji and Faustino E. Moranda have applied to the federal government for a concession for the use of the waters of the Rio Blanco and the Los Xuxchites waterfall, in the state of Vera Cruz, to develop electrical energy. D.

BANNING, CAL.—The Coachella Ice & Electric Company, and the Holton Power Company purpose jointly to spend $281,655 in carrying power from Banning to El Centro through the Coachella Valley. The distributing system in Coachella alone will cost $58,000. T.

KASLO, B. C.—This city has practically completed negotiations for the purchase of the electric light and power plant owned by the Kootenai Electric Company in this city. Extensive improvements and additions are planned. Address Mayor D. C. McGregor for information. O.

ORANGE, N. J.—The Common Council is considering the extension of the municipal electric lighting plant and system, at a cost of about $13,000, being based upon estimates formerly prepared by Chief Engineer Henry Berg. The improvement is estimated to effect a saving of about $1,500 per year. A.

DODGEVILLE, WIS.—Failure of the Dodgeville Electric Light Company to comply with orders of the Railroad Commission for improving service resulted in a supplementary order directing the overhauling of the entire system and the immediate employment of an engineer to take charge of the plant.

WEST SALEM, WIS.—The State Railroad Commission has ordered improvements to the Neshonoc plant and that the company shall submit plans to the Commission for a hydroelectric power and light plant to be built at the site of the present one in such a manner as to allow for additional units to be installed. C.

VAN NUYS, CAL.—Work on the final stretch of the San Fernando ornamental lighting system will start in the very near future. This stretch will include South Sherman Way and the state highway. B. F. Kierulff, Jr., & Company, are doing the work. When complete this system will be 25 miles in length. T.

ARTESIA, N. M.—It is proposed to construct an electric generating plant at the falls of the Penasco River between Elk and Lower Penasco to furnish power for the proposed Cloudcroft-Artesia interurban line being promoted by the General Electric Company of Kansas City, Mo. The water power is owned by Vernon L. Sullivan. D.

CITY OF MEXICO, MEX.—The Federal Government has received the following applications for water-right concessions to develop electric energy: Maria Guadalupe A. de Garcia, for the waters of the Rio de la San Jeronimo, state of Jalisco, to develop water power; and Jose Julian Mandez, for the waters of the Rio de San Jeronimo, state of Jalisco. D.

OMAK, WASH.—The installation of electric power stations on the Okanogan River, and an immense pumping plant just north of this city, to furnish an auxiliary supply of water for the orchards in the Robinson Flat section of the Okanogan Irrigation project, have been ordered by the Federal authorities and sufficient funds have been set aside to pay for the work, according to Project Manager Calvin Casteel, of this city.

VICTORIA, B. C.—The Stamp Falls Power Company has been incorporated with a capital stock of $150,000. Among its objects are to acquire the rights of the Ritchie Agnew Power Company in the Alberta district, an option to purchase all the interests of the British Columbia Hydraulic Power Company, including its water rights on Nanaimo River and the company's 40-year franchise for electric lights and power in Nanaimo.

POINT GREY, B. C.—DuCane-Dutcher Company, consulting engineers, this city, have completed a preliminary report covering the proposed power and light plant to cost $240,000. A hydroelectric plant and substation, also recommendations for a steam turbine plant, oil-fire boilers, the oil engines to be used for light loads, a pole-line system and a system of underground conduits is proposed. The report will be acted on by a new council, yet to be elected. South Vancouver is also considering a proposed municipal light and power plant.

TACOMA, WASH.—George H. Cecil, of the Department of Agriculture, announces that the Secretary of this department has issued a water-power permit to the Washington Railway & Electric Company, of Tacoma, authorizing this concern to use a site within the Snoqualmie National Forest for the purpose of generating hydroelectric power. The project covered by the permit involves erection of nine separate dams, water conduits and power houses. All but one of these dams will be for diversion purposes only, the exception being the storage dam. A transmission line approximately 55 miles long will be required to transport power to Everett, the nearest important market. Engineers of the Forest Service rate the capacity of the combined project at 32,600 horsepower. Construction of the first unit by the contract is required to start by June 1, 1915; the second unit must be started by January 1, 1917; and thereafter construction upon one unit annually, until the entire project is completed.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SEYMOUR, IOWA.—F. Dunn, of Milo, has purchased the Seymour Telephone Company property and will remodel the system.

STAFFORD SPRINGS, CONN. — This town is considering the installation of a modern fire-alarm telegraph system. W.

CLINTON, OKLA.—The German American Mutual Telephone Company has been incorporated by J. A. H. Werning, J. B. Thompson and others.

ODON, IND.—Flint, Kyle Telephone Company has been incorporated with a capital of $10,000 by J. C. Flint, William T. Kyle and Rebecca Flint.

HICKMAN, KY.—A. W. Davis, manager of the Home Telephone Company, has completed arrangements for a new line to Cayce, a distance of ten miles from here.

GLASGOW, KY.—Barren & Monroe County Telephone Company has been incorporated with a capital of $3,500 by W. E. Taylor, C. B. Miller and L. C. Griffiths.

CHESTER, O.—The Chester Telephone Company has been incorporated with a capital of $15,000 by G. C. Quigley, C. H. Bond, H. O. Jacobs and H. S. Mills.

ATOKA, OKLA.—The Atoka Telephone Company has been incorporated with a capital of $1,000 by T. R. Williams, J. N. Roach, W. W. Betts and R. D. Lail.

SANDVILLE, W. VA.—The Citizens Telephone Company has been incorporated with a capital stock of $5,000 by S. K. Somerville, Dempsey Hawkins and others.

ASTORIA, ORE.—Representatives of the Marconi Wireless Telegraph Company were here recently negotiating for a site for the erection of a large wireless station.

CLINTON, OKLA.—German-American Mutucla Telephone Company has been incorporated with a capital of $550 by J. H. A. Werning, J. B. Thompson, W. E. Been.

BOTTINEAU, N. D.—The Turtle Mountain Farmers Telephone Company has been incorporated with a capital stock of $15,000 by John A. Frederickson and others.

HELENA, MONT.—Standard Engineering Company has petitioned for a franchise for an electric light and power plant here. H. G. Pickett, president of the Commercial Club, may be addressed.

BELVIDERE, ILL.—The Illinois Northern Utilities Company is negotiating for a site here for a plant to cost about $500,000 to be used as a central station for their system. Address the general manager.

GRASS VALLEY, CAL.—The Supervisors of Nevada County have granted permits to construct telephone lines along county roads to the Lime Kiln Grass Valley Rural Telephone Company, the American Hill Telephone Company and the Mariposa Rural Telephone Company.

MT. VERNON, WASH.—The stockholders of the Skagit Valley Rural Telephone Company, have decided to incorporate and unite several rural companies of the county into one system, and to make extensive improvements. J. H. Carlson, of this city, is president, and J. M. Shields, secretary. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

STOCKTON, CAL.—The Stockton Electric Railroad Company has been granted a franchise for the extension of its El Dorado Street line.

FOND DU LAC, WIS.—Wisconsin Southern Railway Company will build 23 miles of new track this year. Charles D. Smith is general manager. C.

BILLINGS, MONT.—Surveys for an electric railway proposed by Big Horn Canyon Irrigation & Power Company it is stated have been completed. C.

SAN ANGELO, TEX.—J. D. Sug, owner of the San Angelo Street Railway System, is contemplating the extension of the system and the erection of a power plant. D.

MANITOWOC, WIS.—Plans are being considered to increase the equipment at the Manitowoc & Northern Traction Company's power house. Thomas Higgins is manager. C.

FRESNO, CAL.—The State Railroad Commission has granted the Fresno Traction Company a certificate of public necessity and convenience to extend its line a distance of 9.5 miles.

NAPA, CAL.—The San Francisco, Napa & Calistoga Railway has been granted permission by the Railroad Commission to issue $33,000 in bonds, the bonds to be used as collateral security for notes.

KEOKUK, IOWA.—If the property owners will give the right of way the Keokuk Electric Company is planning to extend its street car lines several miles through an undeveloped territory to the new baseball grounds.

EVANSVILLE, IND.—The Evansville Public Service Company is considering extending its Bell Street line to Woodmere, the Northeast Side Development Club having agreed to pay part of the expense of construction. G.

TACOMA, WASH.—An ordinance has been passed authorizing the issuance of $75,000 in utility bonds for the construction and equipment of a municipal car line to extend from the business section of the city to the tide flats.

CHARLES CITY, IOWA. — Work will begin soon on preliminary plans for the electric road to Creso. A. L. Dodd, manager of the electric light plant, and A. A. Ruste, chairman of the Commercial Club are interested in this proposition. C.

SAN FRANCISCO, CAL. — Engineers for the Crocker Estate Company are engaged in laying out an electric railroad tapping the holdings of the company in the South Hill district of this city. The new line will be 3.5 miles in length.

FRONTENAC, KANS.—A company has been organized here for the purpose of building an electric railroad from Frontenac to Arcadia, a distance of 15 miles. J. S. Patton is president. The company will erect plants at each end of the line to furnish power.

CHATTANOOGA, TENN.—J. W. Adams, who is promoting the East Tennessee Traction Company, which is to build five interurban lines out of Chattanooga, has completed financing the proposition, it is stated, and will be in a position to let contracts in the near future. G.

EVANSVILLE, IND.—Frank C. Gore, attorney for interests which are planning the construction of a traction line from Evansville to Chrisney, Ind., states that litigation which has delayed construction work is practically settled, and that the line will be built during 1914. G.

SAN DIEGO, CAL.—An extension of the existing franchise of the Los Angeles and San Diego Beach Railroad in order that the road may be electrified as ordered by the Railroad Commission is asked in a petition filed in the office of the clerk of this city. It is understood that much new electrical material will be used on this road. T.

EVANSVILLE, IND.—The Evansville Railways Company will build a seven-mile traction line from a point in Indiana north of Owensboro, Ky., to connect with its Evansville and Rockport line, now in operation. A substation will be erected. The cost of the work it is estimated will be $250,000. G.

MISSOULA, MONT. — Plans for electrification of the Milwaukee from Deer Lodge to Three Forks have been completed and work will begin early in the spring. It is said that the Milwaukee will build one engine district of electric line each year until the road from Harlewton to Avery is entirely equipped with electricity. A.

DALLAS, TEX.—A charter has been granted to the Dallas Northwestern Traction Company. The Company will construct and operate a line of interurban railways between Dallas and Wichita Falls. The capital stock is $500,000. The incorporators are E. P. Turner, Ben B. Cain, L. S. Thorne, John T. Witt, E. L. Sargent, R. Fenby, Otto H. Lang, S. P. Cochran and others.

MILL VALLEY, CAL.—The Marin County Electric Railway, which proposes to construct a street railway in Mill Valley with a branch from the Northwestern Pacific Depot to the Old Hill and Cascade Reservations, has applied for a certificate of public convenience and necessity and for authority to issue $50,000 in stock and $50,000 in bonds. The application is signed by B. F. Ames, as president, and W. W. Hicks, as treasurer and secretary of the company.

SEATTLE, WASH.—An ultimate expenditure of $3,000,000 for a combined elevated, surface and subway municipal street-car system for this city is proposed by William Pitt Trimble, president of the Seattle Rapid Transit Club. Councilman Max Wardall has introduced a bill in the Council appropriating $3,000 from the general fund, to be cared for in the next tax levy, to be used in defraying the expenses of a rapid-transit engineer to investigate and report the probable cost of the system. This bill for the appropriation has been referred to the Finance Committee. O.

VERNON, B. C.—Sir Donald Mann, vice-president of the Canadian Northern Railway Company, recently announced that his corporation will soon begin actual construction work on the branch railroad line from Kamloops to this city, and south into the Okanogan Valley; also that the Okanogan line will be electrified, as originally announced, which means that the Couteau Power project will be developed, and that besides cheap power for the valley, the not-distant future will witness the construction of electric railway lines radiating from Vernon to all parts of the Northern end of the Okanogan Valley. O.

FINANCIAL NOTES.

The Columbus Railway, Power & Light Company has filed notice of an increase in its capital stock from $1,000,000 to $11,550,000.

At the annual meeting of Northern Ohio Traction & Light Company, F. H. Goff, of Cleveland, was elected a director to succeed the late Louis Bielstein. Other directors and officers were re-elected. Stockholders authorized the issue of $2,000,000 six-per cent preferred stock, making total authorized amount of this class of stock $5,000,000, of which $3,000,000 is outstanding. None of this new stock is to be issued now.

The Southern California Edison Company has sold to Harris, Forbes & Company, Perry, Coffin & Burr and E. H. Rollins & Sons $1,500,000 general-mortgage five-per cent bonds, due November 1, 1939. Bonds are part of an authorized issue of $30,000,000, of which, including the present block, $12,225,000 have been issued. Bonds will be offered at 95 and interest or a 5.35 per cent basis. Net earnings in 1913 were three times the annual interest charges.

The Minneapolis General Electric Company, a subsidiary of the Northern States Power Company, reports output for 1913 as 90,835,808 kilowatt-hours, an increase of 34 per cent over the output for 1912. The number of customers of the company increased 5,406 or 24.8 per cent, the power load increased 7,865 horsepower or 26.7 per cent and the lighting load increased 9,106 kilowatts or 27 per cent. The company on December 31, had 27,168 customers, with 29,433 horsepower of motors, and 29,988 kilowatts of lighting load.

The stockholders of the Galveston, Houston & Henderson Railway Company have authorized the issuance of $5,000,000 bonds, of which $2,000,000 will be used to meet outstanding obligations. The greater part of the remaining sum will be expended in improving the roadbed and bettering the system in other ways. No part of the bond issue will be used in double-tracking the line between Houston and Galveston, however, according to J. H. Hill, vice-president and general manager.

Negotiations are under way for the consolidation of the Oro Electric Corporation and the Northern California Power Company, which, if completed, will create a new electric-power factor in Northern California. Plans provide for a new corporation which, as a holding company, will take over the stocks of the operating companies, issuing its own stocks in exchange. The two corporations represent combined assets of more than $40,000,000, and operate in the same territory, largely in the Sacramento Valley and Northern California.

At the annual meeting of the Standard Underground Cable Company the stockholders unanimously approved the proposition in connection with the financing of their Canadian plant. The capitalization of the Canadian company is $1,000,000 divided into $500,000 common stock and $500,000 seven-per-cent preferred stock. The common stock will be placed in the treasury of the Pittsburgh company, and $350,000 of the preferred will be offered for subscription to holders of the parent company in proportion of one share of Canadian for each ten shares of Pittsburgh held, at $75 a share. The par value of the new Canadian preferred stock is $100 a share. The balance of $150,000 preferred stock will remain in the treasury of the new Canadian company to be utilized for

future needs. It is understood that subscriptions to the new stock will not be offered until after April 1 next.

Dividends.

Boston Elevated Railway Company; a semi-annual dividend of two per cent, a reduction from six per cent to a four-per-cent annual basis. The six-per-cent rate had been in effect since 1902. In 1901, 5.75 per cent was paid; and in 1900, 4.5 per cent.

Central States Electric Corporation; initial of one per cent on common, payable February 19 to stock of record February 11.

Connecticut Power Company; the regular quarterly dividend of $1.50 a share on its preferred stock, payable March 2, to stock of record of February 17.

Twin City Rapid Transit Company; the regular quarterly dividends of 1.5 on the common and 1.75 on the preferred stocks, payable April 1 to stock of record March 14.

United Light & Railways Company, 0.75 per cent on second preferred, 1.5 per cent on first preferred, and one per cent on common, all payable April 1 to stock of record March 16.

Reports of Earnings.

MASSACHUSETTS ELECTRIC COMPANIES.

The Massachusetts Electric Companies report for the quarter ending December 31, 1913, as follows:

	1913.	1912.
Gross	$2,233,491	$2,178,723
Net	601,763	620,494
Surplus after charges	121,489	165,333
Six months' gross	5,167,436	5,000,330
Net	1,787,901	1,912,310
Surplus after charges	789,696	961,387

PHILADELPHIA RAPID TRANSIT.

	1913.	1912.
December gross	$2,141,522	$2,065,830
Net	892,661	844,300
Surplus after charges.	83,999	81,660
Six months' gross	12,239,537	11,926,124
Net	4,839,349	4,796,160
Surplus after charges..	307,342	278,428

AMERICAN RAILWAYS.

	1914.	1913.
December gross	$ 461,719	$ 431,492
July 1-Dec. 31	2,862,315	2,638,116

WASHINGTON RAILWAY & ELECTRIC.

The Washington Railway & Electric Company reports, for the year ended December 31, 1913, compared as follows:

	1913.	1912.
Gross	$4,953,536	$4,648,328
Net	2,283,565	2,133,337
Surplus	1,156,649	1,025,730
Dividends	847,500	685,000
Surplus	309,149	340,730

Out of surplus for year were charged to employees and depreciation and reserves, leaving a balance to profit and loss of $80,849. Profit and loss surplus, January 1, 1914, was $1,113,365.

VIRGINIA RAILWAY & POWER.

	1913.	1912.
December gross	$ 450,487	$ 417,817
Net	233,830	221,495
Surplus after charges..	105,280	104,933
Six months' gross	2,619,118	2,444,010
Net	1,305,963	1,236,032
Surplus after charges..	550,271	538,672

BRAZIL RAILWAY.

	1913.	1912.
November gross	$ 249,733	$ 216,269
Net	90,267	81,824
11 months' gross	2,591,600	2,356,876
Net	950,600	1,006,377

UTAH SECURITIES CORPORATION.

(Utah Power & Light and Subsidiaries.)

December gross	$ 159,866	$ 126,519
Net after taxes	96,741	67,420
Six months' gross	906,723	728,501
Net after taxes	539,599	387,438
Twelve months' gross..	1,739,828	1,462,298
Net after taxes	1,035,835	793,807

MONONGAHELA VALLEY TRACTION.

	1913.	1912.
December gross	$ 87,790	$ 71,731
Net after taxes	53,524	46,539
Surplus after charges	27,350	22,085
Twelve months' gross..	960,261	847,896
Net after taxes	613,549	516,369
Surplus after charges	315,501	255,592

Equivalent to 4.25 per cent on common stock after preferred dividends.

THIRD AVENUE RAILWAY.

Earnings of the Third Avenue Railway, New York City, for December and six months compare as follows:

	1913.	Increase.
December gross	$ 916,844	$ 121,549
Net after taxes	318,302	69,496
Total income	335,428	60,945
Surplus after charges..	80,732	18,202
Six months' gross	5,653,864	670,622
Net after taxes	2,072,971	403,053
Total income	2,110,109	412,091
Surplus after charges .	578,908	48,607

The earnings for the year ended December 31, 1913, after all charges and depreciation, totaled $970,241, equal to 5.9 per cent upon the $16,590,000 stock outstanding.

UTICA GAS & ELECTRIC.

Earnings of the Utica Gas & Electric Company for 1913, December figures partly estimated, show:

	1913.	1912.
Gross earnings	$1,205,100	$1,152,826
Net after taxes	598,112	615,754
Surplus after charges..	332,112	364,535
Balance after dividends	142,112	204,535

KEYSTONE TELEGRAPH.

	1913.	1912.
December gross	$ 107,695	$ 106,480
Net after taxes	53,727	54,621
Surplus after charges..	27,687	28,818
Twelve months' gross.	1,265,779	1,217,429
Net after taxes	625,573	608,361
Surplus after charges..	319,078	305,745

PORTLAND RAILWAY, LIGHT & POWER.

	1913.	1912.
November gross	$ 576,244	$ 570,863
Net after taxes	303,994	281,930
Surplus after charges	127,569	130,165
Twelve months' gross.	6,703,123	6,611,848
*Surplus after charges	1,417,481	1,562,549

*Equivalent to 5.7 per cent on capital stock.

NORTHERN OHIO TRACTION & LIGHT.

	1913	1912
December gross	$ 295,377	$ 259,881
Net	105,082	109,103
Surplus after charges..	54,800	67,597
Twelve months gross.	3,284,533	2,996,037
Net	1,264,879	1,293,271
Surplus after charges..	703,063	770,203

PORTLAND RAILWAY, LIGHT & POWER.

	1913.	1912.
December gross	$ 607,476	$ 586,857
Net after taxes	331,604	308,174
Surplus after charges..	156,121	156,771
Twelve months gross..	6,723,742	6,642,308
Net after taxes	3,425,432	3,313,397
*Surplus after charges	1,416,831	1,552,406

*Equivalent to 5.7 per cent on the capital stock.

BANGOR RAILWAY & ELECTRIC.

November gross	$ 65,372	$ 61,681
Net after taxes	36,668	34,313
Surplus after charges..	19,314	17,074
Twelve months' gross..	758,775	704,076
Net after taxes	414,170	387,398
Surplus after charges..	206,599	189,597
*Balance after preferred dividends	101,599	84,597

*Equivalent to 5.1 per cent on common stock.

AMERICAN PUBLIC UTILITIES.
(Subsidiary Companies.)

	1913.	1912.
November gross	$ 230,352	$ 212,455
Net after taxes	114,681	113,789
Twelve months' gross	2,249,707	.....
Twelve months' net	996,420	.....

(Holding Company.)

	November.	12 Months.
Gross income	$ 118,251	$1,078,291
Net, less expense	114,777	1,030,639
*Surplus after charges	64,547	452,477
Balance after preferred dividends	44,977	217,637

*Including interest on underlying bonds.

DETROIT EDISON.

	1913.	1912.
December gross	$ 583,174	$ 479,300
Net	275,097	230,358
Surplus after charges..	178,392	118,723
12 months' gross	5,546,587	4,385,615
Net	2,324,361	1,858,435
Surplus after charges..	1,118,659	685,509

REPUBLIC RAILWAY & LIGHT.
(Subsidiary Companies.)

	1913.	1912.
December gross	$ 282,300	$ 264,561
Net after taxes	105,452	99,778
Surplus after charges..	62,153	55,693
Twelve months' gross.	2,997,669	2,655,601
Net after taxes	1,153,705	1,045,030
Surplus after charges..	617,441	516,095

EASTERN PENNSYLVANIA RAILWAYS COMPANY.

November gross	$ 70,405	$ 62,939
Net after taxes	31,335	28,996
Surplus after charges..	12,780	11,124
Twelve months' gross..	804,774	711,140
Net after taxes	338,085	277,745
Surplus after charges.	119,291	63,154

EAST ST. LOUIS & SUBURBAN.

November gross	$ 245,851	$ 224,023
Net after taxes	99,702	105,171
Surplus after charges..	49,762	56,573
Twelve months' gross..	2,690,543	2,426,947
Net after taxes	1,118,206	1,099,200
Surplus after charges..	527,755	523,132
Balance after preferred dividends*	177,755	173,132

*Equivalent to 2.5 per cent common stock.

NASHVILLE RAILWAY & LIGHT.

November gross	$ 189,660	$ 181,156
Net after taxes	83,414	82,888
Surplus after charges..	43,586	45,894
Twelve months' gross.	2,198,392	2,068,622
Net after taxes	884,395	881,973
Surplus after charges..	423,094	450,234
Balance after preferred dividends	298,094	325,234

CLOSING BID PRICES FOR ELECTRICAL SECURITIES OF THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 2	Jan. 26
American Tel. & Tel. (New York)	123	123½
Commonwealth Edison (Chicago)	133½	133½
Edison Electric Illuminating (Boston)	257½	257½
Electric Storage Battery common (Philadelphia)	51¼	50
Electric Storage Battery preferred (Philadelphia)	51¼	50
General Electric (New York)	147	147¼
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1⅛	1
Massachusetts Electric common (Boston)	12	14
Massachusetts Electric preferred (Boston)	63½	65¾
National Carbon common (Chicago)	155	155
National Carbon preferred (Chicago)	116¾	116¾
New England Telephone (Boston)	139½	139½
Philadelphia Electric (Philadelphia)	26¼	26⅝
Postal Telegraph and Cables common (New York)	82	82
Postal Telegraph and Cables preferred (New York)	69	67½
Western Union (New York)	63¼	63⅝
Westinghouse common (New York)	71	70¾
Westinghouse preferred (New York)	116	116½

*Last price quoted.

PERSONAL MENTION.

DR. H. O. TYLER, has been appointed to be research associate in the research laboratory of electrical engineering, Massachusetts Institute of Technology.

MR. M. S. SLOAN has been appointed manager of the railway and electric departments of the New Orleans Railway & Light Company, in place of MR. D. A. HEGARTY, resigned.

MR. JOSEPH GOODNOW has been appointed superintendent of the Hartford & Springfield Street Railway Company, Hartford, Conn., succeeding MR. R. W. REYNOLDS, who resigned to become manager of the Springfield Street Railway.

MR. CHARLES O. BOND, president of the Illuminating Engineering Society, presented a paper entitled "Light and How to Use It," before the Philadelphia Section at the Drexel Institute on Saturday evening, February 7.

MR. L. H. BROWN, superintendent of the Lynn power station of the Bay State Street Railway, was elected president of the New England Society of Superintendent Engineers at their annual meeting and banquet in Boston, January 28.

MR. EDWARD SCHILDHAUER was elected chairman, and CAPT. W. H. ROSE, secretary-treasurer of the newly created Panama Section of the American Institute of Electrical Engineers at a meeting of the Board of Directors held at the Hotel Tivoli, Canal Zone, in December.

MR. A. A. GRAY, general manager of the Electrical Review Publishing Company, gave a talk before the Milwaukee Electrical League on Tuesday, February 3. At this meeting Mr. Gray was made an honorary member of the League, being the first to receive this distinction.

MR. E. K. HALL, vice-president of the New England Telephone & Telegraph Company, was the principal speaker at the meeting of the Boston Plant Chapter of the Telephone and Telegraph Society of New England on Tuesday evening, January 27. The title of the address was "An Intimate Talk on Some of the Larger Problems of the Company."

MR. S. M. GREER, general commercial superintendent of the Chesapeake & Potomac Telephone Company, delivered an address, entitled "Looking Ahead," before the meeting of the Telephone Society of New York on Tuesday evening, January 27. Mr. Greer was formerly assistant general commercial manager and later Metropolitan manager of the New York Telephone Company.

MR. HUGH L. COOPER announces that he has completed the water-power development of the Mississippi River Power Company at Keokuk, Iowa, and that he has opened offices at 101 Park Avenue, New York City, where he will engage in the practice of general hydraulic engineering, including the design, construction and management of hydroelectric power plants.

MR. JOHN R. GRAHAM, president of the Bangor (Me.) Electric Railway Company, was given a complimentary dinner by the members of the transit committee of the Massachusetts Legislature of 1893, on which he served, at Young's Hotel, Boston, January 27. Others present were those who made a trip to Augusta, Me., last August as Mr. Graham's guests. A loving-cup was presented to Mr. Graham at the dinner.

CAPT. WILLARD L. CANDEE, president of the Okonite Company, accompanied by Mrs. Candee, returned on Wednesday of last week from a three months' tour in British Guiana and Europe, spending some time in London visiting Mr. and Mrs. E. Phillips Oppenheim, old-time friends. Captain Candee is much improved in health as a result of the trip, and has again resumed the active management of his large interests in the insulated-wire field.

MR. A. C. M. HERDLING, general sales manager of the Dubilier Electric Company, Incorporated, New York City, was for 12 years connected with the district engineering department of the American Telephone & Telegraph Company, conducting special laboratory tests and research. The Dubilier Electric Company manufactures special forms of electric heaters, resistance units, resistance wire and material for X-Ray, therapeutic and dental work.

MR. W. COVERT JONES has severed his connection as sales manager for the Union Electric Company, Pittsburgh, Pa., to become district sales manager of the Chicago office of the American Eveready Company, manufacturers of Eveready batteries and flashlights. Mr. Jones started with the Union Electric Company as salesman about seven and a half years ago; he was then given charge of the city store in Pittsburgh, and later was appointed sales manager of the company.

MR. DAVID F. TOBIAS has been appointed manager of the Electric Vehicle Bureau of the United Electric Light & Power Company, of New York City. This office has been created for the purpose of furthering the sale and use of electric vehicles in New York. The United Electric Light & Power Company intends co-operating with other companies in the distribution of vehicles and accessories, as well as with garages and owners of vehicles. A special effort will be made to interest the operators of horse-drawn vehicles in "Doing It Electrically."

MR. W. E. BOILEAU, who has been general manager of the Chattanooga (Tenn.) Railway & Light Company since its organization, has resigned, effective at once. He began his work in that city as manager of the Chattanooga Electric Company in 1907, and when a consolidation of corporations resulted in the formation of the present company, he became general manager of it. It is reported that he desires to retire in order to take a well-earned and much-needed rest. It is stated that he will probably be succeeded by MR. EDWARD D. REED, who is now superintendent of the company.

MR. E. T. MUNGER has been chosen general manager of the Cumberland Light & Power Company, the Lewiston, Augusta & Waterville Street Railway Company and the York Light & Heat Company, important Maine lighting and traction interests. He will assume his active duties February 15. Mr. Munger is a graduate of the University of Wisconsin, class of 1892, and is 44 years of age. He has engaged in electrical and mechanical engineering during his whole career, having been connected with leading traction companies throughout the eastern part of the United States. MR. HARRY B. IVERS, the retiring general manager, will remain with the companies until April 1, in an advisory capacity.

MR. JAMES PARMELEE, local capitalist and dominating spirit in the Cleveland Electric Illuminating Company since that corporation was formed, resigned as a director at the annual meeting and is succeeded by MR. HARRISON WILLIAMS, of New York. Mr. Parmelee's retirement forecasts his resignation also as president of the company at the first meeting of the Board of Directors. It is understood that MR. SAMUEL SCOVIL, vice-president and treasurer and the active executive official in Cleveland, will succeed Mr. Parmelee as president. The Parmelee-Herrick interests in the company were greatly reduced a year ago when a controlling interest was purchased by the Central States Electric Corporation, of which Mr. Williams is the head.

MR. KING G. KELLOGG, who has been chief engineer of the E. E. Brownell Engineering Company for the past four years, has tendered his resignation to take effect March 1, and will thereafter devote his entire time to consulting work, specializing in matters pertaining to the electrolytic corrosion of underground metallic structures from stray electrical currents. Mr. Kellog has had a wide experience in electrolysis work, as the installation of a number of electrolytic mitigation systems were completed while he was chief engineer, and he has made electrolysis examinations and tests in more than 50 different cities in this country. He held various positions in the engineering department of the Peoples Gas Light & Coke Company, Chicago, where he was employed for 16 years. He was educated in the Chicago Public schools and is an alumnus of the University of Illinois. He will retain his office at 1836 South Fifty-fifth Street, Philadelphia, Pa.

MR. HAROLD ALMERT, consulting engineer, for the past five years manager of the Department of Examinations and Reports of H. M. Byllesby & Company, has severed his connection with that firm to engage in consulting engineering practice, with offices in the Rookery, 209 South La Salle Street, Chicago. Mr. Almert is just completing his twentieth year of active work in the organization, financing, design, construction, operation and management of public utilities, and for several years past has valued or passed upon investments for new projects, consolidations, reorganizations or extensions to existing properties of from one hundred to two hundred million dollars, annually. In his practice before public utility commissions, which has extended from New York to California, he has handled many important rate cases, has served as arbitrator in a number of condemnations, and in these lines has established a new and important field of usefulness for the engineer with training in law and accounting, as well as technical training and experience. As assistants, Mr. Almert will have associated with him a staff of well seasoned specialists in mechanical, electrical, gas and hydraulic engineering, appraisals, rate investigations, accounting and efficiency work, who, by their training and years of experience, are experts in their lines.

OBITUARY.

MR. FERDINAND KUEHN, wireless telegraph operator on the steamship *Monroe*, lost his life early Friday morning when the former was rammed by the steamship *Nantucket*. Mr. Kuehn gave his life preserver to a woman aboard the sinking vessel who was not properly equipped, and when the ship went down he perished along with 46 others.

NEW INCORPORATIONS.

SYRACUSE, N. Y.—Syracuse Electric Razor Sharpening Company has been incorporated with a capital stock of $10.000 by J. F. Williams, C. M. Scott and E. E. Hare.

CLEVELAND, O. — The Konary Electric Company has been incorporated with a capitalization of $10,000 by C. F. Schultz, M. E. Evans, M. E. Schultz and H. M. Krause.

LONG BEACH, CAL.—Articles of incorporation have been filed here for the Towne-Lantz Electric Company, with a capital stock of $15,000, by A. A. Towne, F. O. Lantz and others.

AUGUSTA, ME.—Stromberg Electric Company has been incorporated to manufacture recording devices. The capital stock is $400,000 and the incorporators are I. S. Kearney and E. H. Thompson.

CLEVELAND, O.—The Industrial Electric Company has been incorporated with a captital stock of $25,000. The incorporators are W. J. Austin, Harold Ferguson, W. B. Stewart, C. W. Kinnison.

TOLEDO, O. — The Lighthouse Electric Company has been incorporated with a capital stock of $10,000. The incorporators are Samuel L. Allen, F. H. Farnsworth, George W. Fink, George H. Frank and S. M. Hegel.

PORTLAND, ME.—The American Electric Car Company has been incorporated to manufacture electrical devices. The capital stock is $1,500,000. The president of the company is A. F. Jones and the treasurer, T. L. Croteau, of this city.

ELIZABETH, N. J.—The Elizabeth Electrical Supply Company has been incorporated with a capital of $10,000 to deal in electrical supplies. G. V. Wier, C. K. Nelson, Elizabeth; and J. A. Donington, Roselle Park, N. J., are the incorporators.

LOUISVILLE, KY.—The Standard Lighting & Heating Company has been incorporated with $1,000 capital stock, and will establish a plant. Details regarding the project are not yet available. T. C. H. Vance, Inter-Southern Building, is in charge of the matter.

NEW YORK, N. Y.—Grannell, Nugent & Kranzer, Incorporated, has been incorporated to manufacture electrical appliances, etc. The capital stock of the company is $15,000 and the incorporators are Levi W. Grannell, Brooklyn, N. Y.; Frank L. Nugent and William J. Kranzer, of New York City.

LITTLE ROCK, ARK.—Articles of incorporation have been filed for the Seven Cities Company, of Russellville. This corporation is capitalized at $250,000. Henry Chouteau is president; D. R. Neiderlander, vice-president, and A. E. Hecker, secretary and treasurer. The company will operate electric plants.

WILMINGTON, DEL.—Removable Letter Sign Corporation has been incorporated with a capitalization of $250,000 to design, construct and deal in electrical advertising display signs. The incorporators are W. M. Pyle, George G. Steigler, Lawrence W. E. McCarthey all of this city.

NEW YORK, N. Y.—Quick Charge Storage Battery Company, Incorporated, has been granted articles of incorporation to manufacture storage batteries, electrical goods, motors, etc. The capital stock is $500,000 and the incorporators are Stanley C. Sabel, Russell Law and Leslie Reid, all of New York City.

GLEN RIDGE, N. J.—The Nitro Electrical Corporation has been incorporated with a capital of $50,000 to operate in electrical supplies. M. S. Powell, Harry D. King and Grattan Colvin, Glen Ridge, are the incorporators.

PROPOSALS.

ELECTRIC LIGHT PLANT.—Bids will be received on February 10 for the installation and equipment of an electric light plant. Address Clerk of the Board of Commissioners of Public Works, Lake City, S. C.

CONDUIT AND WIRE.—Bids will be received on February 9 for 100,000 feet No. 14 twine wire or its cost equivalent in other sizes; 40,000 feet of half-inch rigid conduit or its cost equivalent in other sizes; 1,000 feet of half-inch "T" type outlet boxes or their cost equivalent in other types and sizes. Address Ray Palmer, city electrician, Chicago, Ill.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until February 24 for furnishing 10,000 feet of rubber-insulated lead-covered single-conductor copper cable, as per Schedule 6340, for delivery at the Navy Yard, Brooklyn, N. Y.; and five electrically operated meat and food choppers, as per Schedule 6351, for delivery at the Navy Yard Brooklyn, N. Y.

WATERTIGHT LIGHTING FIXTURES.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until February 9 for furnishing watertight electric-lighting fixtures and accessories of special engineer department design, including 21 junction boxes, three snap switch boxes, 12 platform light fixtures and 69 type X outlet couplings. For further information address Joseph E. Kuhn, Lieutenant Colonel, Corps of Engineers, U. S. Army.

ELECTRICAL MATERIAL.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until February 17 for furnishing 120 receiver cords, for double-head receivers for wireless apparatus, and 140,000 feet of silicon bronze aerial wire, as per Schedule 6312, for delivery at the Navy Yard, Brooklyn, N. Y.; 1,250 pounds pure lead wire in 50-pound coils, as per Schedule 6318, for delivery at the Navy Yard, Washington, D. C.; and 103 fire-control telephones, as per Schedule 6322, for delivery at the Navy Yard, Boston, Mass.

RUBBER-INSULATED CABLE.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until February 7 for furnishing rubber-insulated cable as follows: 1,000 feet, 250,000 circular mils, stranded single-conductor rubber-insulated armored cable; 3,200 feet 212,000 circular mils, stranded single-conductor rubber-insulated armored and served cable; 1,500 feet 10,000 circular mils stranded duplex rubber-insulated armored and served cable and 2,000 feet 18 circular mils single-conductor, duplex, rubber-insulated armored cable. Detailed specifications and further information may be had upon application to Joseph E. Kuhn, Lieutenant Colonel, Corps of Engineers, U. S. Army.

NEW PUBLICATIONS.

MEASUREMENT OF WEAK CURRENTS.—We are in receipt of a reprint of the article by Bela Gati, published in *L'Industrie Electrique*, entitled "Measurement of the Intensity of Small High-Frequency Currents."

MOTOR STANDARDIZATION.—The Electric Power Club, an organization made up of representatives of many of the manufacturers of electric motors in the United States, has published the standardization rules adopted by the club for obtaining uniformity in sizes, voltage ratings, speed ratings and other important features of both direct and alternating-current motors. The secretary of the club is C. H. Roth, 1410 West Adams Street, Chicago, Ill.

DESTRUCTION OF TELEPHONE RECORDS.—Regulations to govern the destruction of records of telephone, telegraph and cable companies (including wireless companies), as prescribed by the Interstate Commerce Commission in accordance with Section 20 of the act to regulate commerce, have been published in pamphlet form. These regulations became effective on February 1, 1914, and supersede a previous order dated May 13, 1912. The order of the Commission putting the regulations into effect and the regulations themselves are given in full. There is also an index to the records.

DATES AHEAD.

Wisconsin State Telephone Association, Madison, Wis., February 11-12. Secretary, P. J. Weirich, Monroe Wis.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20. Secretary, Bradley Stoughton, 29 West Thirty-ninth Street, New York, N. Y.

Electrical Supply Jobbers' Association. New Willard Hotel, Washington, D. C., February 17-19. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

Peoria Electric Show. Peoria, Ill., March 9-15. Director, T. D. Buckwell, Central Illinois Light Company, Peoria, Ill.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. B. Burritt, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Hotpoint Electric Heating Company, Ontario, Cal., has placed on the market a new type of its ElPerco electric coffee percolator, which is made of aluminum. The company has prepared a number of these percolators made in glass for demonstration purposes by its selling agents throughout the country. A circular describing this new development will be sent upon application to the company.

Maschinenfabrik Oerlikon, Oerlikon, Switzerland, has prepared for distribution a 44-page well illustrated book dealing with the use of electric motors in the textile industry. This publication is very completely illustrated with views of motors suitable for this work and with typical interiors in motor-driven textile establishments. Every department of the textile industry in which power is used is described and the types of motor suitable therefor are pointed out.

Magnet-Schultz, Memmingen in Schwaben, Germany, one of the largest firms specializing in magnet manufacture, has published a 44-page illustrated catalog of its electromagnets. This catalog is replete with descriptions of numerous uses of magnetic clutches, magnetic plates, lifting magnets, electromagnetic separators, sand-sifting machines, portable and stationary electromagnets, magnetizing apparatus, equipment for removing iron particles from the eye, and many other electromagnetic devices.

Simplex Wire & Cable Company, 201 Devonshire Street, Boston Mass., has ready for free distribution the 1914 Simplex Manual. This contains in addition to full information regarding Simplex products, tables and other data about insulated conductors and other electrical matters for the ready reference of electrical engineers, contractors, wiremen and others interested in the calculation of wiring and cable requirements. The book contains 92 pages and is printed on fine, thin paper, with stiff covers, so as to conveniently fit the pocket.

Automatic Electric Washer Company, Newton, Iowa, has published a new and attractive book describing its electric washing machines. This book is copiously illustrated with views of the several types of washers made by the company and of the convenient way they can also be made to operate other devices, such as mangles, churns, ice-cream freezers, etc. Each washer is described in detail and its advantages pointed out. The economy and satisfaction of electric washing are emphasized. Each machine has a wringer attached. Simplicity and durability characterize the design.

Economy Fuse & Manufacturing Company, Kinzie and Orleans Streets, Chicago, Ill., has ready for distribution a booklet describing and illustrating its renewable cartridge fuses. The construction of these devices is explained in detail and the ease with which they may be renewed in the proper manner is emphasized. Detailed lists of a great variety of fuses of this type made by the firm are included. In a folder recently prepared by the company there is a discussion of fuse costs and it is stated that the Economy renewable fuses enable a saving of over 80 per cent of the annual fuse expense.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has issued a number of new publications, of which one having 48 pages deals with modern alternating-current watt-hour meters. The construction of these meters is described in great detail with the aid of numerous excellent illustrations of the entire instrument and its more important parts. There are also given many fine illustrated inserts showing views in the extensive meter department of the company's works. These give an idea of the extent of this department and of the high degree of specialization employed in the various stages of the manufacture. Testing curves are also given and diagrams of meter installation. In a similar manner another publication deals with ampere-hour meters. The latter publication has 24 pages and points out the details of construction and advantages of using this type of meter for many services. Other recent publications by this company deal with the new nitrogen lamp which it manufactures under the name of Nitralampe. This half-watt tungsten is made in sizes from 600 to 3,000 candlepower. A special mounting and reflector equipment has been provided for these lamps.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces receipt of the following orders: Southern Power Company, one 3,000-kilovolt-ampere portable substation consisting of a steel car, switching equipment, three 1,000-kilovolt-ampere, 100,000/13,200-volt, 60-cycle transformers, one 20-horsepower, three phase, 110-volt motor for driving a Sirocco blower. Fitzpatrick & Hoepfner, one 200-kilowatt and one 150-kilowatt three-wire, compound-wound, 240/130-volt generators, one 100-kilowatt, three-bearing motor-generator set consisting of a 240/120-volt three-wire, compound generator and a 550-volt, shunt motor; 16 direct-current, 230-volt, one half to five horsepower motors for use with the fans and blowers; one commutator-turning tool; one air-cooled portable electric blower. Leslie B. Grant, one 250-kilowatt 2,300-volt, three-phase, 60-cycle, generator with one exciter; three 85-kilowatt 2,200/6,600-volt transformers; three lightning arresters, 6,600-volt, indoor mounting, and switchboard. Public Service Electric Company, 1,000-kilovolt-ampere, 60-cycle, 13,200-volt, three phase to two phase duplex transformer. St. Clair County Gas & Electric Company, one 1,000-kilovolt-ampere frequency-changer set consisting of one 2,300-volt three phase, 62.5-cycle generator and one 2,300-volt, 25-cycle synchronous motor with exciter; one similar 250-kilovolt-ampere frequency-changer set; one 150-kilowatt, motor-generator set consisting of 220-volt, three-phase, induction motor and compound-wound generator; three 500-kilovolt-ampere 25-cycle, 13,200/2,300-volt transformers.

Record of Electrical Patents.

Issued by the United States Patent Office, January 27, 1914.

1,085,102. Insulating Compound. L. E. Barringer, assignor to General Electric Co. Contains linseed oil, sulphur, zinc, talc, asbestos and flint.

1,085,108. Pedal-Operator. J. C. Cake, Chester, Pa. Driven by an electric motor through a friction disk.

1,085,116. Dynamo-Electric Machine. F. H. Ford, assignor to Mechanical Appliance Co., Milwaukee, Wis. The stator core is secured in a special partly opened ring frame.

1,085,124. Printing-Telegraph Receiver. G. S. Hiltz, assignor to Stock Quotation Telegraph Co., New York, N. Y. Includes electromagnetically operated type disks.

1,085,142. Selective-Transmitter. M. Levison, assignor to Chicago Signal Co., Chicago, Ill. Includes a motor-driven contact device.

1,085,144 and 1,085,145. Lamp-Supporting Structure. C. F. Massey, Chicago, Ill., assignor to C. F. Massey Co., Chicago, Ill. A reinforced-concrete post with bracket arms for ornamental tungsten cluster lighting.

1,085,147. Portable Electric Lamp. W. A. McKay and M. Claussen, San Francisco, Cal. Includes a horizontally extending clamp having slidable vertical tubes.

1,085,151. Induction-Motor Control. M. Milch, assignor to General Electric Co. Includes an alternating-current commutator machine having its arma-

ture connected to the rotor of the induction motor, a driving motor therefor, a frequency changer driven by the induction motor, a transformer connected to the armature of the commutator machine whose exciting winding is alternately connected to the transformer or frequency changer.

1,085,163. Electric Meter. P. Rose, Berlin, Germany, assignor to General Electric Co. Comprises a fixed coil, an oscillating magnetic member having a remanent magnetization co-operating therewith, and means for intermittently demagnetizing the member. (See cut.)

1,085,213. Trolley Harp. C. D. Larrabee, Syracuse, N. Y., assignor of one-half to S. Hubbell. The fork base is vertically pivoted to the harp platform.

1,085,215. Push-Button. A. Lungen, assignor to Edwards & Co., New York, N. Y. Covers details of construction.

1,085,266. Switching Device for Electric Circuits. M. Kallmann; P. Kallmann, Berlin, Germany, administratrix of said M. Kallman, deceased. A circuit-breaker with a supplementary pilot switch.

1,085,282. Mower. F. D. Mercer, Toronto, Ont., Canada. Comprises an electric cutter, an insulated cutter bar with a number of flexible sections and means for electrically heating the cutter.

1,085,309. Leakage Indicator and Connections. E. B. Wedmore, assignor to General Electric Co. Relay indicator for a distribution system includes solenoids connected to the mains, a beam responsive to unbalanced action of the solenoids and a yielding means for its fulcrum. (See cut.)

1,085,316. Dynamo-Electric Machine. T. S. Allen, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. A special commutator construction.

1,085,318. Trolley. D. E. Barton, Milwaukee, Wis.; J. H. Spence, administrator of said Barton, deceased. The wheel axle is supported on only one side.

1,085,340. Apparatus for Electric Ignition. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Provides two spark plugs in each cylinder and a special magneto, timer and control therefor.

1,085,347. Electromagnetic Lock. L. L. Leduc, assignor to L. Cadenel, Paris, France. The core of a solenoid constitutes the locking bolt. (See cut.)

1,085,375. Sectioning Means for Electric Stations. E. Brandenburg, Brussels, Belgium. A special automatic control for sectionalizing circuit-breakers.

1,085,393. Apparatus for Reducing Electric Currents. R. J. Ward, Dunton, N. Y. Includes condensers, a resistance and a relay switch.

1,085,398. Electric Switch. F. Barr, New York, N. Y. Includes a longitudinally moving spindle carrying spring switch contacts.

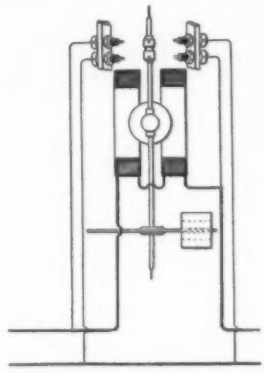
1,085,412. Electric Alarm - Clock. F. Goss, Millicent, S. A., Australia. The alarm circuit is closed through the hands of the clock.

1,085,425. Electrical Primer. J. M. Hobe and U. S. Traub, Yonkers, N. Y. Includes an electric heater for heating a hydrocarbon fuel.

1,085,433. Electrical Signal Apparatus. W. Kepler, Allenville, Ill. A spring-contact push-button.

1,085,440. Method of and Furnace for Securing Products of Reaction by Electric Discharges in Gases. C. F. R. von Koch, Stockholm, Sweden. Consists in creating an arc flame extending from a heating chamber into a cooler and causing gases to pass from the chamber into the cooler.

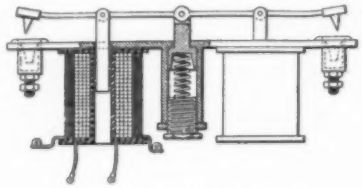
1,085,441. Display Apparatus. K. Koike and G. L. Grant, assignors to K. Takahashy, Seattle, Wash. Includes an electric projecting lamp.



1,085,163—Meter.

1,085,453. Locomotive Headlight. E. H. Marshall, Lawrence, Kans. Adjustable electric headlight.

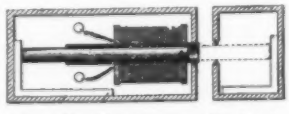
1,085,454. Automatic Switch. F. R. McBerty, assignor to Western Electric Co. A selector has a rotary brush carriage, a number of contact arms pivotally mounted thereon, and corresponding terminals arranged to be successively traversed by the contact arms.



1,085,309—Leakage Indicator.

1,085,477. Electrically Driven Winding Apparatus for Spring Motors. W. P. Phillips, Bridgeport, Conn. An electric motor actuates the winding mechanism.

1,085,485. Automatic Switch for Traction Lines. F. Rice, Dayton, O. A switch-operating solenoid is mounted in a contact box located in the roadway.



1,085,347—Electromagnetic Lock.

1,085,496. Apparatus for Type-writing at a Distance. H. E. M. Schnürer, Grunewald, Germany. Includes an electric motor at each receiving and transmitting station, connected by a line circuit.

1,085,497. Connector for Electric-Current-Carrying Conductors. H. Schroeder, Sollitt, Ill. For connecting the electric cable between railway cars.

1,085,514. Dynamo-Electric Machine. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co. Provides special ventilating passages through the stator core.

1,085,523. Heat Treatment of Metal Bodies. J. H. Barker, assignor to Birmingham Metal & Munitions Co., Birmingham, England. Provides for electric annealing of metal cartridge cases and includes a plain electrode movable in axial direction by the inner plunger and means actuated by the outer plunger whereby the circuit is closed and opened.

1,085,579. Ozone Generator. S. Held, assignor to Held Co., Chicago, Ill. Comprises concentric dielectric tubes, an electrode in contact with the outer surface of the outer tube and a continuous electrode concentric within the inner tube.

Patents Expired.

The following United States electrical patents expired February 2, 1914.

576,082. Automatic Switch. J. P. Alexander, Jackson, Tenn.

576,095. Battery. W. S. Doe, Brooklyn, N. Y.

576,103. Electric Arc Lamp. P. H. Fielding, New York, N. Y.

576,129. Electrical Advertising Device. L. Julig, San Francisco, Cal.

576,145. Method of and Apparatus for Electric Propulsion. L. H. Nash, South Norwalk, Conn.

576,163. Paste-Carrying Machine for Electric Accumulators. W. Schneider, Triberg, Germany.

576,164. Construction of Cells for Electric Accumulators. F. W. Schneider.

576,177. Electrode for Storage or Other Batteries. T. A. Willard, Norwalk, O.

576,178. Battery Plate. T. A. Willard.

576,202. Rheostat. H. W. Leonard, East Orange, N. J.

576,240. Electric Meter. J. R. Tucker and C. C. Hinckley, Aurora, Ill.

576,243. Contact Apparatus for Telegraphing. C. Vreede, Rotterdam, Netherlands.

576,268. Contact-Box for Depressible Conductor Rails. W. Grunow, Jr., Bridgeport, Conn.

576,332. Locking Device for Electric Controllers. G. Valley, Johnstown, Pa.

576,333. Electric Controller. G. Valley.

576,342. Electrically Operated Musical Instrument. G. H. Davis, New York, N. Y.

576,347. Electric Heater. F. A. Johnson, Binghamton, N. Y.

576,369. Automatic Electric Cutout. C. C. Kritzer, Newaygo, Mich.

576,372. Automatic Electric Cutout for Magneto Bells. J. Z. Miller, Baltimore, Md.

576,383. Alarm for Electric Circuits. C. B. Sterling, New York, N. Y.

576,384. Brake Mechanism and Controller for Electric Cars. W. D. Thomas and L. R. Gignilliat, Savannah, Ga.

576,399. Insulator. H. E. Billings, Hartford, Conn.

576,394. Trolley for Electric Cars. G. L. Campbell, Shunk, Pa.

576,472. Telephone Signal-Transmitter. E. C. Robes, Medford, Mass.

576,475. Electric Arc Lamp. D. A. Shesler, Toledo, O.

576,493. Electrical Circuit for Operating Automatic Railway Gates. J. S. Biggar Chicago, Ill.

Reissue No. 11,588. Electric Meter. J. Harris, Lynn, Mass.

Electric Vehicle Section

Dr. Steinmetz on the Future of Electric Vehicles.

At the meeting of the Electric Vehicle Association of America, at New York on Wednesday evening, January 28, Colonel S. R. Bailey presented a recital of his experiences in driving a Bailey roadster from Boston to Chicago. Colonel Bailey's story, which has been published in full in recent issues of this publication, was thoroughly enjoyed by all present.

In discussing the subject of the evening, "The Electric Pleasure Car," Dr. C. P. Steinmetz declared that the great share of the automobile future belongs to the electric and he predicted that as the ultimate economy and efficiency of electrics are developed the gas car will necessarily recede in favor of the electric. Automobiling, he said, is still largely a creature of sporting proclivities, but is fast changing into a practical business utility. The owner today really uses his car more for business, or necessary traveling, than he does for purely recreation purposes, and will do so more in future. The Doctor believed that, just as the bicycle had its craze, then waned and became a practical machine of daily business—just as numerous as ever, but more practical—the automobile will stabilize itself and become a creature of daily necessity.

The car of the future, he said, is bound to be a car which everyone can own and run without effort. The large car will always require its chauffeur and when long journeys are wanted owners will prefer to use the comfortable Pullman train rather than undergo the strain of running and steering a large car amid the hardships of road travel. Already, he believed, that touring is waning and that the short drive of 50 or 60 miles is the average use of the automobile. The Ford car, with its cheapness, lightness and easy driving characteristics—a car which anyone can own and drive—he believed to point the future trend of autos. In his opinion, batteries will gradually be evolved to make such light, cheap cars driven by electricity possible and he strongly deplored the tendency toward over-luxuriousness in the average type of electric now offered to the public. For himself, he said he wanted a practical car and had bought a cheap second-hand one which he still drives.

Dr. Steinmetz discussed the development of the electric-vehicle storage battery and warmly endorsed the characteristics of the Edison nickel-iron cell. He also pointed out the fact that coincident with the improvement in dependability of the vehicle more adequate arrangements for charging and boosting were being provided all over the country.

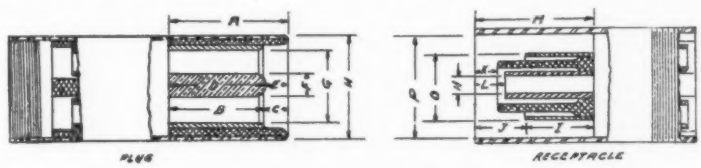
The doctor believed that the need of the hour is co-operation between central stations and vehicle and battery makers, in an effort to bring about the more widespread distribution of charging stations. He deplored the popular idea of automobile shows which included both gas and electric cars. They no more belong together, he said, than do the horse wagon and the automobile, or the horse and the locomotive engine. He hoped the electric would keep to its own field and that by united effort it would be more and more practical for just such journeys as Colonel Bailey had taken and described.

Standard Charging Plugs and Receptacles.

The Committee on Standards of the Electric Vehicle Association of America has recommended a standard charging plug for both the 50-ampere and 150-ampere size, the dimensions of which are given herewith together with an illustration showing the principle features of the plug. This recommendation was accepted by the Electric Vehicle Association of America at its October, 1912, meeting, and reaccepted at the annual convention in Chicago in October, 1913.

The National Board of Fire Underwriters has approved plugs of these dimensions for 50-ampere and 150-ampere ratings, with an allowable overload of 50 per cent. An important feature of the plug is the polarity, the outside contact being positive, the inside contact negative. The terminals should be large enough to receive cable having a rating according to the Underwriters' Code, "Table B," at least equal to the normal rating of the plug. The terminals are to be marked "plus" and "minus" to correspond to the polarity of the contacts.

The Committee on Standards is composed of E. R. Whitney, chairman, Alexander Churchward, J. R. C. Armstrong, H. H. Rice, W. E. Holland, E. J. Ross, Jr., E. Fruenfelt, Charles Blizard, J. H. Hertner and Louis Burr.



Contacts must be accurately concentric to insure interchangeability.

Capacity	A	B	C	D	E	F	G	H	I	J	K	L	M	Receptacle N	Plug N	Receptacle O	Plug O	P
50 amp	1 5/16	1 1/16	3/8	1 5/8	5/16	.373 .375	1.123 1.127	1.725	1 1/8	7/16	3/8	3/8	2	.375 .377	.360 .365	1.123 1.125	1.136 1.140	1 3/4
150 amp	2 3/4	1 1/16	13/16	2 1/16	5/16	.435 .437	1.406 1.408	2.100	1 5/32	1 1/16	5/16	7/16	2 3/32	.437 .439	.422 .427	1.406 1.406	1.416 1.421	2 1/8

Data on Standard Charging Plug and Receptacle Recommended by Electric Vehicle Association.

Boston Motor Club.

The January meeting of the Electric Motor Club of Boston was held at Hotel Thorndike on January 28. Plans for the Boston Auto Show in March were discussed and a committee of the club was chosen to co-operate with committees of other automobile organizations in forestalling unfavorable legislation affecting automobile interests. About 50 bills which are regarded as adverse to the business have been introduced at the legislative session which recently opened.

The February meeting of the club will be held at the American House, Boston. Governor Walsh, Mayor Curley of Boston, the State Highway Commission, the Street Commissioners of Boston, and other public officials will be invited. The meeting will be held under the auspices of the Boston Edison Company. The latest developments in the electric-vehicle field will be shown by lectures and lantern slides, for the benefit of the special guests.

Philadelphia Section — Electrical Vehicle Association of America.

The first public meeting of the Philadelphia Section of the Electric Vehicle Association of America was held in the Franklin Institute on Wednesday evening, January 14.

President Frank W. Smith and Secretary Harvey Robinson were present from New York representing the parent association. Mr. Smith addressed the meeting giving to a certain extent the history of the association, its aims, and outlined the work which was being accomplished by the activities of the officers and various committees. He called attention to the fact that during the two years—1913 and 1914—there would be spent for the advancement of the electric vehicle field, by this association, approximately $100,000. The largest part of this expenditure was in the shape of advertising in the national magazines, and is expected to benefit all manufactures alike. When inquiries are received in response to these advertisements a memoranda is sent to each of the vehicle manufacturers who are contributing toward the expense of this campaign.

In his opening remarks, the chairman, R. L. Lloyd, referred briefly to what was hoped to be accomplished by the formation of the Philadelphia section, saying:

"It is certainly gratifying to see on this occasion, the first meeting in Philadelphia of representatives of the Electric Vehicle Association of America, so numerous a gathering of persons all of whom are interested in some way in the electric vehicle. It has been our endeavor to bring together for mutual interest and benefit not only the manufacturer of cars and their users, but also garage men, battery makers and sellers of accessories and electric current.

"From the best source of information, there would appear to be 37,000 electric vehicles in this country today. Two-thirds of this number are stated to be of the passenger car type. This statement is very significant, for if one should take a toll of the cars in the large commercialized centers of the East, a very different proportion would be found to exist. In our own city there are approximately twice as many commercial cars as passenger cars. In New York the proportion is ten to one. In Brooklyn also, the commercial cars predominate, but as we move westward in the cities of Cleveland, Detroit and Chicago, the passenger cars are found to largely predominate, and when we reach as far as Denver there is found to be one passenger car for each 217 of the population. If this same proportion existed in Philadelphia, there would be some 7,000 more cars on our streets than there are today, so there seems to be plenty of room for growth before we approach the saturation point."

The paper of the evening was presented by Emlen S. Hare, vice-president of the Commercial Truck Company of America. The paper was illustrated with numerous lantern slides, and the field of the electric vehicles was very fully covered. From his varied experience in the sale of electric cars, Mr. Hare was enabled to intersperse among the actual data of numerous installations amusing anecdotes and peculiar phases sometimes met with. Mr. Hare stated that 90 per cent of the cases calling for motor trucks could be satisfactorily handled by the use of the electric car. The other 10 per cent are admittedly gas car propositions and no attempt should be made by electric truck salesmen to enter that restricted field. Many varieties of electric cars were illustrated and a number of adaptations of the electrics in special service were also exhibited.

The next meeting will be held on February 11, when it is expected papers will be read on the actual experience of the electric truck department store work.

The committees of the Philadelphia Section, Electric Vehicle Association of America, as at present constituted are as follows:

Papers and Publicity Committee—Chairman, Fred. B. Neely; George M. Graham, the *North American;* Mr. Foljambe, of the *Commercial Car Journal;* J. M. Skinner, Philadelphia Storage Battery Company; H. K. Mohr, Philadelphia Electric Company.

Membership Committee—Chairman, J. Crawford Bartlett, Bartlett Electric Garage; E. S. Hare, of the Commercial Truck Company; A. W. Young, Public Service Company, Camden, N. J.; Mr. Kalas, Electric Storage Battery Company.

Traffic and Good Roads Committee—Carroll A. Haines, Park Garage; John Meyer, Philadelphia Electric Company; A. W. Young, Public Service Company; E. S. Hare, Commercial Truck Company; Metcalf, Anderson Electric Carriage Company.

Garage Committee—F. E. Whitney, chairman, Commercial Truck Company; J. Crawford Bartlett, Carroll Haines, James M. Skinner, Malcolm L. Gross, W. A. Manwaring, Sydney L. Crawford.

The next meeting of the Philadelphia Section will be held on February 11 at 226 South Eleventh Street. "Some Experiences of Motor-Car Users" will be related by E. J. Hancock, of the Curtis Publishing Company, and others.

Truck Standards in Card Form.

Sets of cards showing the various commercial-vehicle standards recommended in 1912 by the National Association of Automobile Manufacturers are being mailed to all manufacturers of commercial vehicles by the National Automobile Chamber of Commerce, Inc., successor to the National Association of Automobile Manufacturers and the Automobile Board of Trade.

There are seven cards in the set, all of uniform size, 8 x 10 inches, printed on one side only and scored in the middle so that they can be filed flat in an ordinary letter file or folded once and put in an eight by five inch card index file. Each card refers to a single subject so that the series can be separated and the cards distributed among the various departments in the factory to which they relate. The subjects are as follows: "Standard Warranty," "Standard Speed Rating," "Standard Body Weight Allowance," "Overload Allowance Resolution," "Standard Caution Plate," "Standard Frame Widths and Lengths," and "Standard Demonstration Charges."

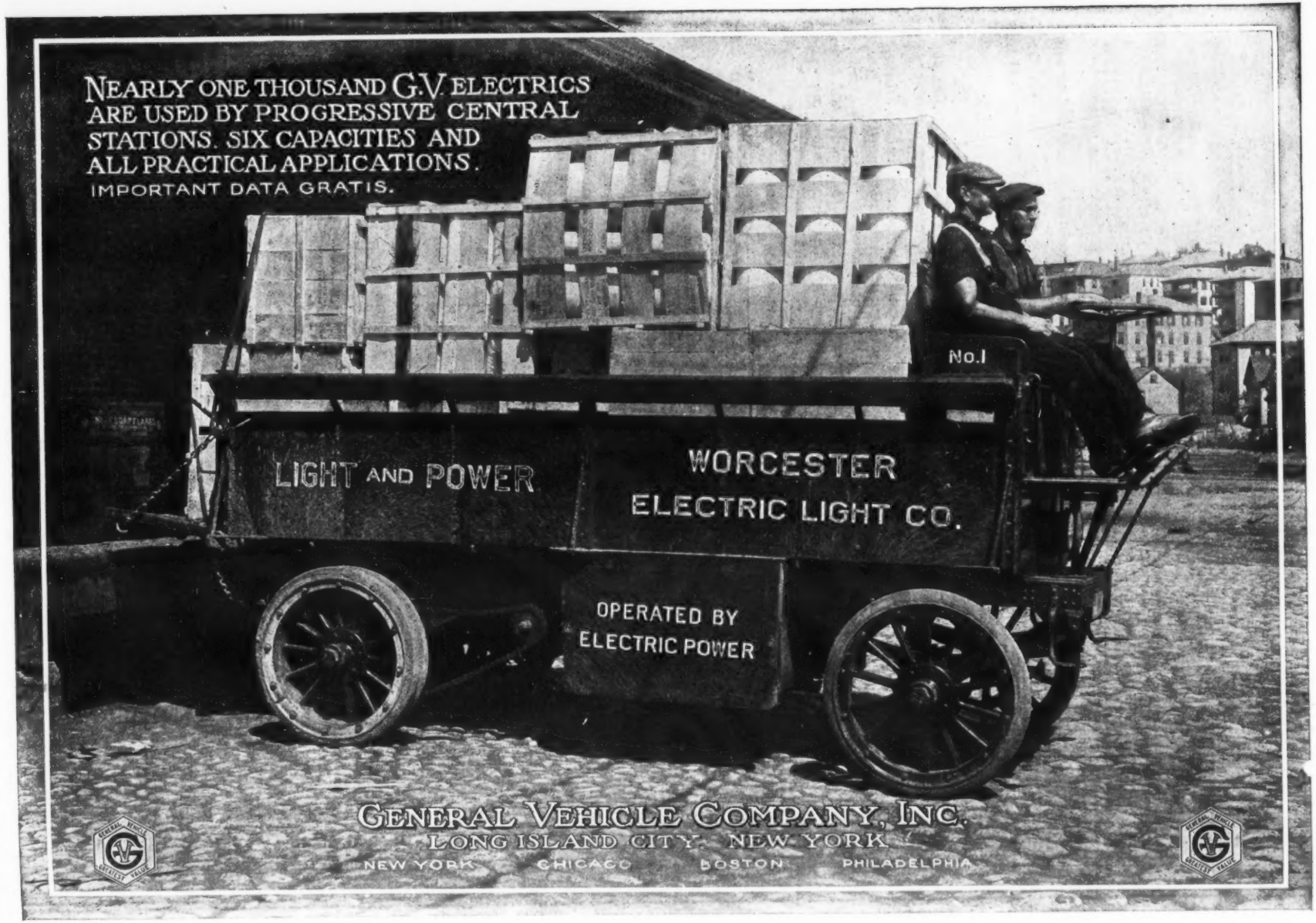
The "Warranty" is a new form approved December 3, 1913, and supersedes the motor-truck warranty recommended by the National Association of Automobile Manufacturers in 1912. It is a combination of this with the standard passenger-car warranty adopted in 1910, and covers both commercial and passenger vehicles.

The tables of speeds, body weights, frame dimensions, and demonstration charges are accompanied by charts of curves corresponding with the figures. The caution plate against overloading and overspeeding and the new lithographed standard warranty are illustrated by half-tone engravings. Prices at which the plates and warranties can be obtained are given.

To encourage the prompt and general adoption of these standards for the best interests of the whole industry, the National Automobile Chamber of Commerce is sending sets of the cards to all companies whose names appear on its list of active manufacturers of commercial vehicles. Upon receipt of request, it will mail copies to any makers who fail to receive them, and to organizers of new companies who expect to come into the field with new products. Requests should be addressed to the secretary of the Commercial Vehicle Committee, National Automobile Chamber of Commerce, 7 East Forty-second Street, New York City.

A New Light Electric Truck.

The Wagenhal's Motor Company, of Detroit, Mich., maker of the well known gasoline three-wheeler of 800 pounds carrying capacity, has a new electric commercial car out for test. The general plan of the truck is the same as the standard three-wheeler, and energy is furnished to a General Electric motor by a 24-cell "Exide" storage battery. The carrying capacity is the same as that of the gasoline type and the new car is to sell for $790.


NEARLY ONE THOUSAND G.V. ELECTRICS
ARE USED BY PROGRESSIVE CENTRAL
STATIONS. SIX CAPACITIES AND
ALL PRACTICAL APPLICATIONS.
IMPORTANT DATA GRATIS.
No.1
LIGHT AND POWER
WORCESTER
ELECTRIC LIGHT CO.
OPERATED BY
ELECTRIC POWER
GENERAL VEHICLE COMPANY, INC.
LONG ISLAND CITY, NEW YORK
NEW YORK CHICAGO BOSTON PHILADELPHIA

More GOULD Battery Installations That Evidence Good Service

Contractors' trucks and wagons for delivering building material must carry heavy loads over rough roads and in bad weather, which often makes the service particularly severe.

Among firms in these lines who are profiting by the dependability and low maintenance cost of Gould-Storage-Battery-driven trucks are the following:

H. C. & A. T. Piercy Contracting Co., New York.

T. I. Proud Electric Co., New York.

Robertson Cataract Co., Electrical Contractors, Buffalo.

J. C. Sterns Electric Co., Buffalo.

Union Transfer Co., Philadelphia.

I. T. Williams Co., Wholesale Lumber, New York.

Meyer & Martin, Carpenters, New York.

J. F. Shannon, Hardware, Philadelphia.

Walbridge & Co., Hardware, Buffalo.

Palmer & Lockwood, Hardware, Stamford, Conn.

Lilly & Stalnaker, Hardware, Indianapolis.

Gould Storage Batteries are now driving so many vehicles of every kind, from light pleasure and delivery wagons to New York street cars, that their achievements and satisfactory service need no description.

Get one Gould Battery and you will be glad to get more.

Gould Battery renewals fit jars of any make.

Tell us your conditions and size of battery and we will gladly quote.

Also, get literature on our power plant installations.

Gould Storage Battery Co.

GENERAL OFFICES: 30 EAST 42nd ST., NEW YORK CITY

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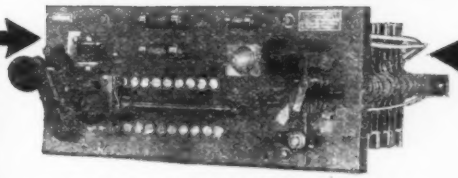

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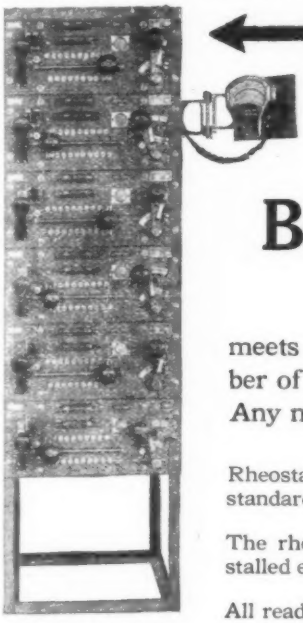

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New Universal Unit Type Battery Charging Equipment

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meets the requirements of the small and large garage alike. Any number of single charging units up to six can be mounted on a standard frame. Any number of frames can be mounted side by side.

Rheostats or frames can be added like sections of a sectional bookcase. Everything is standardized and every convenience—every safeguard—is provided.

The rheostats are all within easy reach for operation without rods. They can be installed easily and quickly, and the connection arrangements on the back are very simple.

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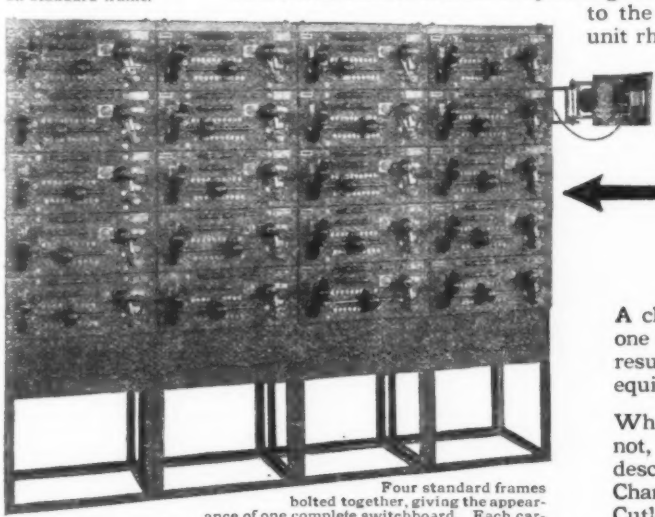
There is no chance of error in operating the wrong rheostat as the sliding handle is adjacent to the controlling switch of the rheostat and each unit rheostat is complete in itself.

The result of our long experience in the design of charging rheostats is expressed in this new unit type charging equipment.



Four standard frames bolted together, giving the appearance of one complete switchboard. Each carries five charging sections mounted with a blank space for other at the bottom.

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A charging outfit of several panels may be installed at one time or during the course of several years. The result will be the same. You will have a uniform equipment installed in the smallest possible space.

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Massachusetts Electrical Research Division to Study Store Delivery.

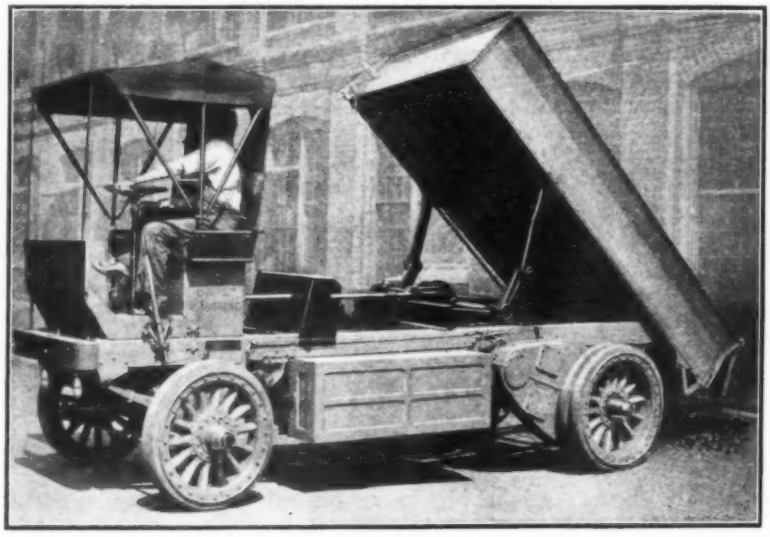
Theodore N. Vail, president of the American Telephone & Telegraph Company, declared some time since that business firms would do well to endow scientific research and in line with this statement he has contributed liberally to the development of research organizations for looking into methods of efficiency for business corporations. Supplementing Mr. Vail's expression the firm of R. H. Macy & Company has contributed largely for an investigation to be made by the Massachusetts Institute of Technology. The object of the investigation will be the determination of the general economic laws underlying the operation of the delivery service of a large retail department store. The observations will be made by the Technology Institute's electrical research division upon the delivery system of the Macy store. It will be remembered that the electrical research division has already collected a great amount of data upon this subject. The delivery department of the Macy store constitutes in itself a business enterprise of large proportions. The goods purchased at the New York store are distributed without charge to the customer over an area equal to about one-third of the state of Massachusetts. To provide for quick deliveries a system of distributing depots has been developed, the packages being transferred in large vans from the store to the depots. The system means the employment of about 400 vehicles, together with the necessary attendants, and the expense of the delivery system is upward of $1,000,000 a year.

Baker Exhibits New Dumping Truck and a New Brewery Truck.

The Baker Motor Vehicle Company has announced a new four-ton dumping body on their standard four-ton chassis.

This dumping body is made of sheet steel inforced with angle iron and is well riveted together. The floor is made of channel steel riveted together with a smooth steel plate on top for a floor. The tail gate is locked and unlocked by a lever at the side of the driver's seat. The body can be tipped to an angle of 45 degrees. The tipping is done by two arms, one on each side of the body, fastened to a large steel crank shaft which revolves in one direction only; two-thirds of the revolution to tip and one-third to lower. This allows the body to come down to its position on the chassis frame in half the time required to raise it for dumping. The body may be raised and lowered to its regular position in 50 seconds.

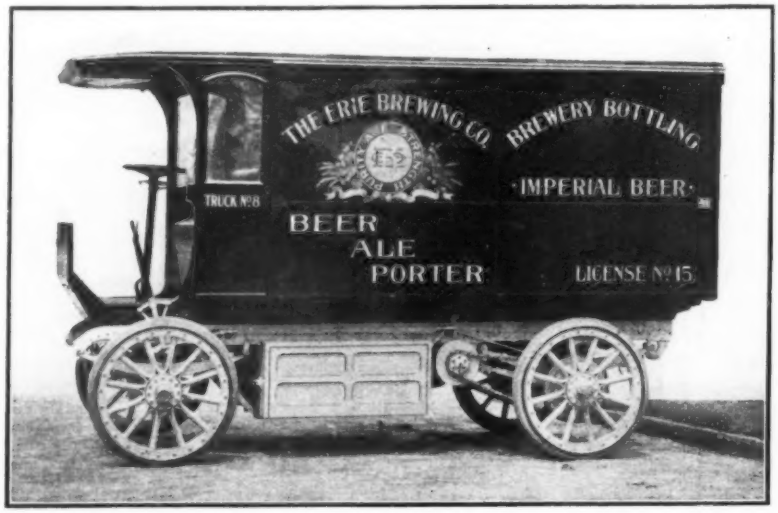
The dumping is done by either a hand crank or an auxiliary motor mounted under the seat and driving through a shaft and worm "eight" spur gear reduction on the crankshaft. This shaft runs in oil contained in a dust-proof housing.



Baker Four-Ton Dumping Body on Standard Four-Ton Chassis.

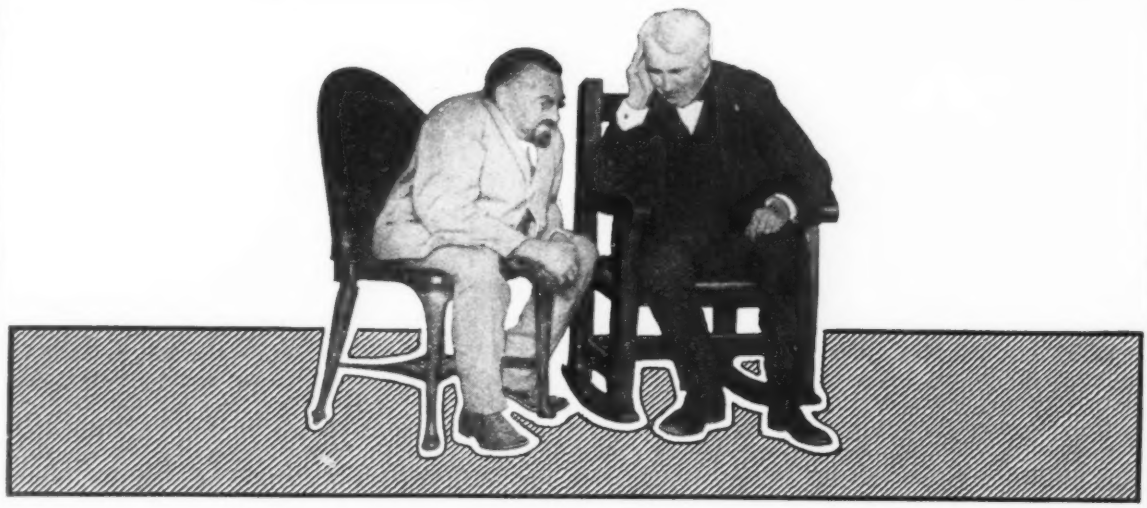
Owing to the growing demand among brewers for a light delivery truck to quickly handle their bottled goods in small towns and residence districts in larger cities, the Baker Motor Vehicle Company has perfected and is now announcing a new standard 3,000-pound truck for this service.

The body is neat in appearance, with loading space 106 inches long, 46 inches wide and 60 inches high, carrying 54 beer cases of 24 bottles each per load. The cases are arranged in two rows nine cases long by three tiers high. The side panels of the body are made of two sliding doors, each one-half the length of the body and no opening in the rear. Each door slides on roller bearings on an over-head track which is always free from dirt. Each door has a spring lock which cannot be opened without the key when closed. By using this system of doors the driver can take out any case of bottles without disturbing the rest. This arrangement saves considerable time. As the truck is unloaded and filled with empty cases, there is no handling of empties to get at the full ones, as is the case when access is made through the rear.



Baker Light Delivery Truck.

This body construction has been pronounced unique, serviceable and very satisfactory. The Erie Brewery Company, of Erie, Pa., was the first to install this type of truck and is well pleased with the work it has done.

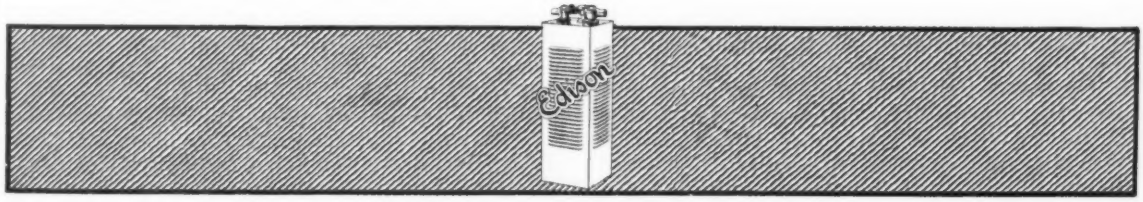


Steinmetz Says:

"I believe that the Electric will be the car of the future on account of its simplicity of operation and reliability. It is rare that it gets out of order. When it does so it is an accident—not as with the gasoline car, an incident. The man of moderate means cannot afford a horse and buggy because of the attention required. He will be able to afford an Electric Vehicle to take him to business because it requires no attention—if equipped with an *Edison* Battery. It often has to stand idle for several days and this is not good for a lead battery. I have tried to invent a lead battery that would not spoil, but gave it up."

Charles P. Steinmetz

From an Approved Report of Some Extemporaneous Remarks of Dr. Chas. P. Steinmetz at a Recent Meeting of Engineers.



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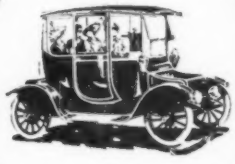

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